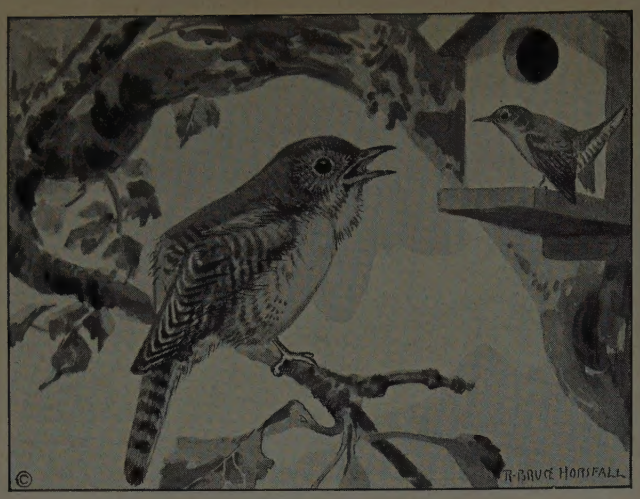
NATURE MAGAZINE

BRUARY 1933 35¢ VOL. 21, NO. 2



House Wren—Ohio State Bird

Birds of the States

HOW, WHEN AND WHY THEY WERE CHOSEN AS OFFICIAL EMBLEMS

A 16-page booklet, size 8½ x 11½ inches, presenting 30 full color paintings (2½ x 3½ inches) of all the State birds thus far selected

Paintings by R. BRUCE HORSFALL, *Art Director of Nature Magazine*

[Detailed correlative text characteristic of each bird]

Descriptive Text by CARRA E. HORSFALL

Also a complete list of the State flowers. An illustrated article on the birds and the method of their selection stating legislation under which each was adopted.

By KATHERINE B. TIPPETTS, *Chairman, Division of Conservation, General Federation of Women's Clubs*

50 cents per copy

25c per copy (Ten or more copies to one address)

The cost of the booklets is governed by the high cost of color printing and the expense of mailing. Orders for less than ten copies must be charged for at fifty cents a copy; for more than ten at twenty-five cents a copy.

Write to
AMERICAN NATURE ASSOCIATION
1214 Sixteenth Street
Washington, D.C.

Raccoon

Bird and Animal Paintings

BY R. BRUCE HORSFALL

Cloth Bound : Lettered in Gold

Only $1.50

This beautifully printed book, page size 8½" x 11", contains 168 pictures of Birds, Animals, Insects and Butterflies, in full colors,—size 2½" x 3½", and an attractive frontispiece of the American Eagle.

Each picture is accompanied by concise description of the character and habits of the subject.

Helpful suggestions are included to show the use of the book for school, camp, home and other educational purposes.

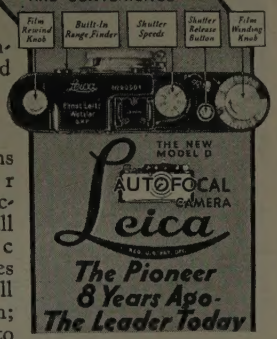
Despite the high cost of color plates and printing all this will cost the readers of Nature Magazine only $1.50 a copy.

Write to
AMERICAN NATURE ASSOCIATION
1214 Sixteenth Street
Washington, D.C.

LEICA'S Built-In Short Base Range Finder
coupled with lens for automatic focusing. No guess-work. Fast and accurate focus obtained even with the speediest subjects.

Focal Plane Shutter with speeds of 1/20th to 1/500th second; moves horizontally instead of vertically, catching action pictures without distortion. Standard cloth construction, unaffected by climate conditions.

EVERY CONTROL ON TOP · RIGHT AT YOUR FINGERTIPS
FOR SPEED, ACCURACY AND CONVENIENCE



7 Interchangeable Lenses including wide angle, telephoto, and others make the LEICA 7 cameras in ONE. Screw type lens mount. Your choice of 200 accessories for all photographic needs. 36 pictures from a single roll of cinema film; enlargements to 12x18 inches and more. Price with 50 mm. ELMAR f:3.5 lens, $92.50. 2-year guarantee certificate.

Dr. Robert C. Murphy of the American Museum of Natural History, says: "After more than 4 years' experience with the LEICA I regard it as the camera that could least be spared from my field equipment."

Write for Free Illustrated Booklet—"Why LEICA?"—also monthly bulletin, "LEICA Photography."

E. LEITZ, Inc. Dept. 238
50 East 10th Street New York

In all the WORLD *No Other* CAMERA *Like This!*

Because it is the only Quick-Acting, Automatic Winding, Ground Glass Focusing Camera using Standard Roll Film. Good for all purposes.

No Double Exposures with "PAL KO"! Used by Government, Educational Institution Experts and important Publishing Companies, where perfect records are required. Simple! Positive! Dependable! Even a novice can obtain perfect pictures every time! 3 Cameras in One! "PAL KO" enables you to take full postcard 3A, or ⅔ or ½ this size—making as many as 19 pictures on a 6 exposure film! RANGE FROM INFINITY AND DOWN TO ABOUT 20 INCHES!

SAVINGS ON FILMS ALONE WILL SOON PAY FOR "PAL KO"! SATISFACTORY PERFORMANCE GUARANTEED OR MONEY REFUNDED!

No Separate Parts or Attachments are Necessary! The astounding features and quality work of "PAL KO" will appeal to you. Obey that impulse—WRITE TODAY FOR FREE CATALOGUE and VERY VALUABLE GIFT OFFER with "PAL KO" purchase.

PAL KO Inc.
819 Wash. Blvd. CHICAGO Dept. T

Nature Rambles

With the publication of *Nature Rambles: Winter,* Oliver P. Medsger has completed the quartet of books through which the author seeks to stimulate the casual wanderer in the fields and woods to a wider appreciation of the Nature that is about him. There is much to be seen during the month of the snows that many of us miss because we do not know or because we are not keenly awake to what may well be observed. Recognizing that winter is different in Florida and California, the author has included in this latest volume chapters on the Nature interest of these states in the season treated. The four books in this group make a fine collection together, although each one stands by itself as a volume. This most recent volume is illustrated with sixteen color plates and with half tones. It is published by Frederick Warne and Company and sells for two dollars.

Some More Questions

So successful have been *Nuggets of Knowledge* and *Popular Questions Answered* that George W. Stimpson has now compiled a third and similar volume, this time under the title *Things Worth Knowing.* We do not suppose the fact that we know why purple is the royal color or whether the President of the United States ever wears a uniform will ever get us a raise in pay or make us more popular at a tea. Just the same we confess we get a lot of amusement from picking up one of these books at odd moments and finding the answers to a lot of odd questions, and questions which are not so odd. There is an amazing variety in the questions contained in this book and its use is furthered by the inclusion of an excellent index enabling one to discover whether a question that comes to mind is included. The publishers are A. L. Burt Company and the book sells for two dollars.

Chemistry

Biological research has much dependence upon a knowledge of physical chemistry and now Dr. David Ingersoll Hitchcock has written *Physical Chemistry* with that fact in view. It is definitely designed for use by students of biology and medicine. The volume is not directed toward the layman unless that layman has a particularly good grounding in both chemistry and biology. The publisher is Charles C. Thomas and the book sells for $2.75.

Horses

Furnishing one of the best known examples of evolution, the horse of today has a most interesting history. Tracing his ancestry to a small, four-toed mammal that lived fifty million years ago in the Eocene period, the development of our equine of today is full of fascination. The story of the horse, in brief and from the scientific viewpoint, is told in a recent leaflet of the Field Museum of Natural History in Chicago. This is entitled *The Geological History and Evolution of the Horse.* It is the work of Elmer S. Riggs, Associate Curator of Paleontology. The leaflet is available from the museum at forty cents a copy.

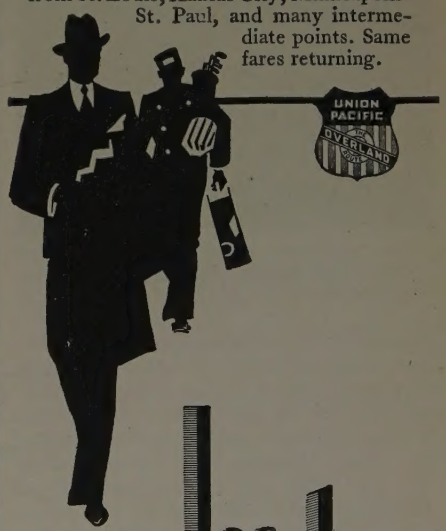
GARDENERS' CHRONICLE

Rock gardening, a subject of prime interest today, is discussed in every issue of the Gardeners' Chronicle in a special department and in feature articles. The information presented is up-to-date, practical and authentic. Six issues of this dependable garden guide cost only $1.00. Single copies 25c.

GARDENERS' CHRONICLE
522-U Fifth Avenue, New York, N.Y.

$40 TO California

One way from Chicago in coaches and chair cars. Proportionately low fares from St. Louis, Kansas City, Minneapolis-St. Paul, and many intermediate points. Same fares returning.



Los Angeles LIMITED

The train with a reputation for perfect service, fine food and unbeatable comfort. Air-conditioned dining cars. Bath, barber, maid, manicure and valet. Same excellent service also on the San Francisco Overland Limited.

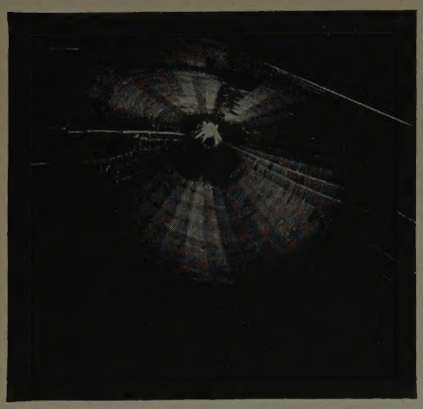
W. S. Basinger, Pass'r Traf. Mgr.
Room 367, Union Pacific Railroad
Omaha, Nebr.
Please send me information about fares to
Name
Address

UNION PACIFIC

Judging Exposures

The light conditions of winter offer some problems to the careful photographer. Many very beautiful pictures are taken on winter afternoons with the long shadows across the snow, and particularly artistic effects may be secured by taking pictures with carefully shaded lens across the shadows, or even slightly towards the sun, especially if the sun itself is obscured by a cloud, a building, or a group of trees. It is very difficult for the amateur or even the professional to judge the value of the light under such conditions and to determine just what is the best exposure. Accordingly, the careful photographer needs a good exposure meter.

The most remarkable advance in exposure meters is represented in the Weston Meter which uses the principle of the electric eye, scientifically known as the photronic photo-electric cell. This cell converts light energy right into electric energy without the use of batteries or any auxiliary means. The



AN INTERESTING FLASHLIGHT PICTURE OF A SPIDER WORKING ON THE NIGHT SHIFT. IT WAS TAKEN BY GRETA OPPE, GALVESTON

Weston Exposure Meter is exceedingly simple to use. It is merely necessary to sight it roughly at the proposed picture and read the value of the light directly on the dial. At the right-hand side of the register dial is a clever revolving scale for interpreting this light value into exact terms of length of exposure and stop number. Any person can readily learn to use the Weston Exposure Meter and thereby guarantee one hundred per cent. perfect results from the exposure point of view. The amateur photographer will be surprised to find more detail and more depth of focus in his pictures than he ever believed possible. The reason for this is that the latitude of modern films and plates permits the registering of some sort of picture, even if the exposure is considerably on the over or under side, but with the exposure just right, the finished results are marvelously improved. The only drawback of this special aid to photographers is the matter of cost, which is now about $36.00.

Most other effective exposure meters depend upon the human eye. One of the most practical and useful of the lower priced exposure meters is the Bewi, or the Bewi Junior. This consists of a little tube with an eye cup to be held closely against one eye. When thus pointed at the object, consecutive little black numbers in little translucent discs appear. It is merely necessary to note the last and highest number visible, which is the "light value." This light value is then set on the rotary scale outside the tube, and the correct speed and stop read thereon. Filter factors are taken care of on the comparison scales. The Bewi Junior is only three inches long and weighs less than three ounces. Its cost, with leather case, is only $6.50. Its only weakness in comparison with the more expensive Weston Meter is the weakness of all exposure meters depending upon the human eye. The photographer's eye becomes accustomed to extreme light or darkness and sometimes fails to readjust itself in the time required for estimating the exposure needed for a given picture. It may be positively stated, however, that exposures checked with a small exposure meter of this type are very likely to be better than exposures guessed. Every good Nature photographer should own and use the best exposure meter that he can afford to buy.

A New Graflex

There is now on display in photographic stores a new Graflex and the devotees of film and focus will not wish to miss having a look at it. This camera is, of course, the product of the Folmer-Graflex Corporation and is called the new National Graflex.

This new camera is in such marked contrast to the Graflex of old that you will scarcely recognize it even as a relative until you study it and find that it has many family resemblances. Notably, this camera is self-contained, requiring no carrying case, closing into extremely compact form, the dimensions of which are but 5⅜" long, 3⁹⁄₁₆" high and 2⁹⁄₁₆" wide. The exterior of durable mottled leather and aluminum trim is handsome and practical; all controls are concealed and protected when the camera is closed. The new National Graflex is built with the same idea of life-long service that has helped to make all Graflex cameras so desirable.

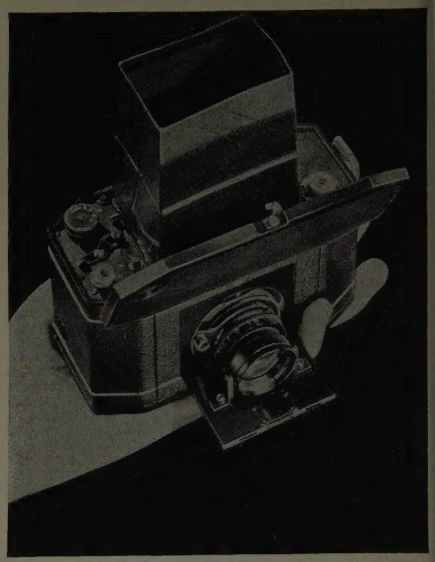
The case itself is built of aluminum die castings of the highest precision, thus insuring maximum lightness, durability and economy. A convenient carrying handle is permanently attached and this has the additional advantage of being a steadying support for the hand holding the camera when in use.

National Graflex mechanical features of operation are multifold. They include the Graflex focal plane shutter and direct full vision focusing devices; the latter eliminates guess-work and insures sharp, exact focusing up to the instant of exposure by permitting a clear full sized view with true illumination values through the lens that takes the picture. Thus, exact arrangement and lighting of the subject are easily controlled. The lens itself is the celebrated Tessar series 1C f 3.5 lens.

A Graflex exposure chart especially devised for the National Graflex is mounted inside the cover in constant view of the photographer for ready reference when the camera is opened for operation. It shows the correct shutter speed and lens setting for all conditions and eliminates exposure guess-work.

Film manipulation in the new National Graflex is most unique. Through a self-centering indicating and film-winding device the film is always correctly registered behind the lens for each exposure. There is no need to check carefully the exposure number through a ruby window in the back of the camera after the taking of each picture.

The simplified operating controls of the new National Graflex also help to make



THE NEW CAMERA BROUGHT OUT BY THE GRAFLEX COMPANY WILL FIT INTO THE PALM OF A HAND AND USES INEXPENSIVE ROLL FILM

National Graflex picture-taking easier, simpler and faster. The new National Graflex is most economical to operate. It uses inexpensive No. 120 8 exposure roll film and secures 10 2¼" x 2½" pictures. Real contact prints are thus available in a size which permits true appreciation of the picture taken and enables better enlargements in greater size to be made.

Miniature Cameras

The modern tendency of amateur photographers to go into the miniature camera field has been growing by leaps and bounds. "The candid camera," a phrase coined to describe the miniature camera work of an amateur who photographs the notables of all the world, has become a by-word. Vest-pocket cameras in various makes may be purchased at prices ranging all the way from $2.00 for a fixed focus toy to $50.00 or $75.00. There are two kinds of so-called vest-pocket cameras using the vest-pocket size film. Some take the so-called full size picture, 1⅝" x 2½", while others divide this area in two and take pictures 1³⁄₁₆" x 1⁹⁄₁₆". The last mentioned cameras can take 16 exposures on an 8-exposure film.

Any picture smaller than 1⅝" x 2½" is really too small to show much of anything by a contact print. It is intended that all the really satisfactory pictures produced by the user of a miniature camera shall be printed by projection and enlarged. Really sharp pictures of this size can be satisfactorily enlarged up to 5" x 7", or even larger, with excellent results. Projection printing with a simple enlarging machine made for small pictures is fun for the amateur. It is a more interesting job than ordinary contact printing, and thousands of the new small camera buyers are learning to do their own enlarging in this way.

Of course, for wild animal or bird photography the smaller, roll-film camera, unsuited for use with telephoto lens, has its limitations. On the other hand, a great deal of entertainment and quite satisfactory results can be obtained with one of these very small cameras by setting it up securely only a few feet from a bird's nest. The photographer then attaches a string to the shutter and conceals himself some distance away. The birds readily become used to the little camera's being there and go on about their business. The same plan may be used to photograph such small mammals as squirrels. As it is sometimes difficult to arrange for a string of sufficient length from the shutter of the camera to the hand of the photographer and be sure that the shutter will operate, one may use the old mouse trap trick. The shutter lever of the camera may be tied to the spring of a flat mouse trap, which is firmly fixed near at hand. The connection is made so that when the mouse trap is sprung it gives just the right jerk on the string to snap the release lever of the camera. That having been worked out, it is a simple matter to attach a longer string to the release catch on the mouse trap and lead that longer string to the photographer's hand. Any slight jerk springs the mouse trap, and the springing of the trap is sure to trip the shutter.

As most of the vest-pocket size cameras will not focus closer than five feet, it is necessary to secure a supplementary lens or portrait attachment for very close up work. Such supplementary lenses can be purchased to fit over the regular lenses of most makes. Having secured such a portrait attachment, it is necessary for the photographer to work out an auxiliary focusing scale. He can do this for himself, when there is no film in the camera, by putting a piece of ground glass in the place where the film would ordinarily be and then focusing on objects at measured distances to determine just what setting on his old focusing scale should be used.

SEND US $1

EXPO WATCH CAMERA

Small as a watch—the Expo Speed Camera—tiny powerful lens operates even indoors, will snap pictures 2 feet to a mile away. The Expo is used by detectives, reporters, etc. It permits picture taking without detection—photos can be enlarged to any size—construction the very same size as a watch—carries a special 5 year guarantee—it's the only fool proof camera in the world. 20 exposure film cost but 35c. We will send the EXPO ON APPROVAL—try it before you buy—just mail us one dollar—use camera for 5 days—full price $4.50 if pleased.

NATIONAL EXCHANGE
815 S. Hill cor. 8th Los Angeles, Calif.

The Photographic Editor is always glad to serve our readers.

Keep and Show Your Snapshots

This New, Better Way . . . with FOTO-TAINER!

Avoids all the keeping up an fuss and bother of old-fashioned album

THE FOTO-TAINER way is so simple, easy and satisfying that it's a wonder nobody ever thought of it before. The handy pockets of one compact FOTO-TAINER will take care of *six times as many snapshots* as a much more bulky album—and the prints in each pocket can be slipped out instantly to be "passed round."

People like to look over pictures if they don't have to hold and "wade through" a thick, heavy album. FOTO-TAINER enables you to keep pictures on each subject in separate pockets, and hand each person just the prints he wants to see—your last vacation trip, the latest snaps of the baby, etc., etc. Several guests can thus look over your camera work at the same time. FOTO-TAINER gives *everybody* the maximum pleasure from pictures!

No More Messy Pasting!

Don't waste any more time and patience pasting up page after page of prints in a bulky, unhandy album—fussing with tabs—constantly having to fix pictures that come loose—and laboriously lettering titles with white ink or pencil. With FOTO-TAINER you can note titles quickly on the backs of the pictures, classify them in separate packets, and you're done. Besides, you can "weed out" those no longer interesting and *re-arrange your whole collection in a few minutes!* Also, the two larger sizes of FOTO-TAINER allow you to put in additional leaves as your stock of prints grows.

With a FOTO-TAINER you can take a greater pride in your pictures and win the admiration of your friends when you show them this new, *handier* way. And the handsomely bound FOTO-TAINER is a really decorative addition to your living-room table.

Why This Way Doubles Your Picture Pleasure

No pasting, tabs or fuss

• • • •

No white ink or pencil needed for titles. Write them on backs

• • • •

You pass the prints, not the album

• • • •

Several people can see pictures at once

• • • •

Special groups kept together

• • • •

Snapshots can be taken out and re-arranged, or discarded, at any time

• • • •

Keeps six times as many prints as an album

• • • •

New leaves can be added

• • • •

Negatives can be kept with prints, if desired

Examine any FOTO-TAINER 5 DAYS FREE

You cannot fully appreciate the convenience of this new way of keeping snapshots until you actually see a FOTO-TAINER. That is why we have decided to send any size and style you choose for 5 Days FREE EXAMINATION. FOTO-TAINER comes in 3 sizes and 3 qualities.

TRAVEL SIZE has 6 removable leaves providing for 250 pictures of all sizes up to post-card size.

The MEDIUM SIZE has 6 removable leaves, providing 16 pockets for 3¼ by 4¼ prints, or smaller —and 4 pockets for 4½ by 6½ or smaller. Holds 400 pictures. (Extra leaves obtainable.)

The LARGE SIZE has 6 removable leaves, providing 36 pockets for 2¼ by 3¼ prints, or smaller—and 6 pockets for "post-card size" or 4 by 5 prints. Holds 500 pictures. (Extra leaves obtainable.)

SEND NO MONEY
Just Mail Coupon

We want you to see for yourself how much more convenient it is to preserve and show your snapshots the new, better way —with the FOTO-TAINER. It will not cost you a cent to examine one or more. Simply check on the coupon the sizes, qualities, and prices of the models you want to see—and mail with your address. We will send the FOTO-TAINERS postpaid. If you do not find this the best way you ever saw of keeping snapshots, send back the FOTO-TAINERS at our expense within 5 days and owe nothing. Otherwise send remittance within the trial period for the ones you decide to keep. Mail coupon today to MEVI, Dept. F, 425 Fourth Ave., New York.

MEVI, Dept. F, 425 Fourth Ave., New York

Gentlemen: Please send me, for 5 Days FREE EXAMINATION, the FOTO-TAINERS I have checked below. If I am not satisfied that this is the best way to keep my photographs, I will return the FOTO-TAINERS within trial period. Otherwise I will at once send you my remittance for those I keep.

(Check squares before price of FOTO-TAINERS you want to EXAMINE)

	Imit. Leather	*Genuine Leather*	*Antique Cowhide*
Travel Size	☐ $2.25	☐ $3.00	☐ $3.75
Medium "	☐ $2.75	☐ $4.00	☐ $5.50
Large "	☐ $4.50	☐ $5.50	☐ $7.50

NAME .....

ADDRESS .....

CITY ..... STATE .....

U OF I
LIBRARY

NATURE MAGAZINE

PUBLISHED BY THE AMERICAN NATURE ASSOCIATION

To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

CONTENTS FOR FEBRUARY · 1933

Photographic Department 50
Some Smart Insects ..... R. W. G. Hingston 55
Odd Friendships ..... S. F. Aaron 60
Musk Thistle—Flower or Weed? .... J. G. Pratt 61
Hard-Skinned Puffballs ... Dr. William A. Murrill 62
The Bird That Eats Last ..... C. J. Pennock 63
The Larder of a Butcher Bird ..... Carl Krebs 64
Bark and Bite ..... Ernest Elwood Stanford 65
Stockholm's Out-door Museum ... Holger Lundbergh 69
Toby Finds a Home ..... Ada Clapham Govan 70
The Eyes Have It ..... Horace C. Frost 71
Cranes of the Elk Lands ..... Smith Riley 74
Tree Resents Use as Sign-Post .... C. A. Lovell 76
Nature Shows the Way to Peace ... Anna C. Packard 77
Maternal Instinct ..... S. F. Aaron 80
Something for the Bald Spots .... Victor H. Ries 81
Regulus Hides in February ..... Isabel M. Lewis 84
Just Hoppers ..... Mary M. Cutter 86
Sooky, A Gray Squirrel ... Myrtle Bascom Boice 87
The Aqua-Plane Race ..... Florence H. Moore 88

ORGANIZATION

THE MAGAZINE

PERCIVAL S. RIDSDALE ..... Managing Editor
ARTHUR NEWTON PACK ..... Associate Editor
RICHARD W. WESTWOOD .. Chief, Editorial Staff
R. BRUCE HORSFALL ..... Artist
EDWARD A. PREBLE ..... Consulting Naturalist
HARRY E. RADCLIFFE ..... Business Manager

THE ASSOCIATION

ARTHUR NEWTON PACK, President, Princeton, N. J.
CHARLES LATHROP PACK, Chairman Board of Directors, Lakewood, N. J.
PERCIVAL S. RIDSDALE, Secretary-Treasurer, Washington, D. C.
RICHARD W. WESTWOOD, Assistant Secretary, Washington, D. C.
HARRY E. RADCLIFFE, Business Manager, Washington, D. C.
WILLIAM L. FINLEY, Director, Wild Life Conservation, Jennings Lodge, Ore.
DR. E. LAURENCE PALMER, Director, Nature Education, Cornell University, New York
RUSSELL T. EDWARDS, Director, Educational Publicity, Washington, D. C.

SCIENTIFIC CONSULTING BOARD

DR. LELAND O. HOWARD — Principal Entomologist, U. S. Bureau of Entomology
DR. WALDO L. SCHMITT — Curator of Marine Invertebrates, U. S. National Museum
DR. HARRY C. OBERHOLSER — Biologist, U. S. Biological Survey
HENRY O'MALLEY — U. S. Commissioner of Fisheries
C. W. GILMORE — Curator of Vertebrate Paleontology, U. S. National Museum
VERNON BAILEY — Chief Field Naturalist, U. S. Biological Survey
DR. PAUL BARTSCH — Curator of Mollusks, U. S. National Museum
DR. EDGAR T. WHERRY — Wild Flower Preservation Society
DR. T. GILBERT PEARSON — National Association Audubon Societies
DR. WILLIAM M. MANN — Director, National Zoological Park

NATURE MAGAZINE, PAST AND PRESENT, IS INDEXED IN THE READER'S GUIDE IN YOUR LIBRARY

NATURE MAGAZINE is published monthly by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C. Additional entry at Greenwich, Conn.

Publication and Editorial Office, 1214 16th Street N. W., Washington, D. C. Additional Offices of Publication, Greenwich, Conn.

ONE YEAR $3
FOREIGN ... $1 EXTRA
TWO YEARS $5
LIFE MEMBERSHIP $100

A. B. McClanahan, Advertising Manager

ADVERTISING OFFICES
New York—425 Fourth Ave.
Washington, D. C.—1214 16th St.
Chicago—360 N. Michigan Ave.
San Francisco—304 Merchants Exchange Bldg.

Copyright, 1933, by American Nature Association

Title Registered U. S. Patent Office

THIS BUSINESS OF HUNTING

A CHALLENGE TO TRUE SPORTSMEN AMONG THE KILLING HERD

THE first hunter of whom we have written word is Nimrod, son of Cush, whose name has become a byword. The type of his weapons is not disclosed. Other early hunters whose arms were chipped flint from Mother Earth, and whose exploits are chronicled mainly in paintings and carvings, also lived in early times, though their exploits are less definitely dated. All these hunted for the best of reasons—that their families might eat. They were strictly utilitarians. When, however, we ponder upon the slight advantage that a few slender slivers of stone gave to these early hunters in their efforts to overcome a cave bear, which was also looking for a dinner, we should be unjust indeed if we rated them less than sportsmen.

Time passed, and the tribes of the cave man and of Nimrod acquired possessions, built cities and proclaimed themselves as civilized. Some among them by their wealth gained leisure, and as wild game grew less abundant in the land, these claimed the sole right of hunting, and punished severely, sometimes even with death, any of the subjugated class who by snare or gin presumed to gain possession of the toothsome deer or hare. Though lord and peasant alike were descended from the cave-dwelling hunters who failed to sign their sketches and in consequence must be nameless, the game was claimed only by the rich and powerful.

Three hundred years ago some of the descendents of these early hunters came to North America. It was then a country unspoiled by civilization, and wild game was abundant. How it was slaughtered and wasted is too long a story, and one too well known to deserve space here. Here there has been neither lord nor peasant, but money power has come to prevail, and now its exponents contend among themselves for the pitiful remnant of wild free game that has survived the devastation.

Theoretically, of course, all hunters are sportsmen and all sportsmen are equal. All pay nearly the same fee for the privilege of hunting the game that belongs to the State, is raised by the farmer or landowner—and finally becomes the property of whoever gets it. And here is where the power of money asserts itself—although the average hunter pays each year only about a dollar and a half for his license, he must spend forty or fifty dollars for supplies and service, and as there are six or seven millions of hunters their contribution totals upwards of a quarter of a billion dollars each year—quite a tidy sum. This is divided between the arms and ammunition companies, the owners of shooting resorts and their attendants, and a dozen other classes of people who profit more or less directly by game destruction. All these people tell the prospective hunter how desirable it is for him to hunt, for there lies health and manliness and Nature knowledge and perpetuation of the game, and a score or so of magazines packed with advertisements and hunting stories help them to tell him. In the eastern states this hunter, having paid his license fee and equipped himself, is privileged, if he can find them, to kill each hunting day for about two months fifteen ducks, four geese, twenty-five rails and gallinules, twenty-five coots, twenty Wilson's snipe, four woodcock and eighteen mourning doves among the migratory species. And of the resident game there are on the books—if not in the coverts—deer, moose, rabbits, squirrels, grouse, quail and turkeys at his disposal. He cannot trap or hound deer or moose, nor snare grouse or quail, but he may bait ducks and geese, and lure them within range with flocks of live birds of their own species. Ostensibly, he is forbidden to bait doves with grain or water, but he invents ways to defeat the spirit of the law, and if his hand is not stayed we shall see the mourning dove follow the passenger pigeon. He may not sell game, but he can buy the privilege of killing it by methods totally devoid of sportsmanship. He may not shoot ducks from an airplane, but he can hire the same airplane to drive them from a sanctuary to his blind. Of course, this is not hunting, because the waterfowl killer merely conceals himself, and shoots the birds that are lured or driven to his gun. But the man who has only his license and a cheap outfit and who lacks membership in a select club, can truly hunt for his game, and lucky he will be if he finds any.

And what of all this? Well, we wonder what are the thoughts of the selfish gunner as he sits in his heated blind, or in his comfortable club-house, waiting for the flight to start. Does he think of his cave-man ancestor who slew the great brown bear or the reindeer that his family might live? When he strives in legislative halls or by subtle propaganda to retain the disgracefully murderous methods that now alone enable him to outwit the vanishing remnant of America's game, does he think of the fast-nearing time when his sons or grandsons will be unable to see alive the beautiful species that by his greed he is now destroying? When he has killed his "limit" a couple of times, does he realize that he has robbed even his fellow-hunters, for there is probably no species of game in the country that is plentiful enough to justify the taking by each hunter of a single day's quota. When he boasts of the superior qualities that hunting engenders in a man, does he ask himself in what way he is exhibiting these virtues in his own hunting?

America's game birds are fast vanishing. When will the true sportsmen of America—for there are some—begin serious efforts to purge their ranks of the slaughterers? They must begin soon, if they wish to save the game.

TWO WISE OLD MARABOU STORKS

Reproduced from an original
painting by Carl Kappstein

NATURE MAGAZINE

VOLUME 21 FEBRUARY · 1933 NUMBER 2

• • •

SOME SMART INSECTS

WHICH RAISE THE QUESTION OF INSTINCT AND INTELLIGENCE

BY R. W. G. HINGSTON

ILLUSTRATED BY R. BRUCE HORSFALL

MANY naturalists of the highest standing, including in America the distinguished Peckhams, have touched on the thorny and difficult subject of the instinct and intelligence of animals. It is an old and well-worn problem, yet one still far from final solution and capable of further illumination by facts. Often and often the old question crops up. Do animals low in the scale of Nature reason? How do they solve their problems of existence? Are they the mere slaves of automatic forces, or do they by deliberate thinking devise means to meet the contingencies of their everyday lives? A honey-bee, for instance, is working at its comb; it is building its cells in uniform hexagons, closing their ends with exact prisms, measuring the sides and inclining the angles according to a complex mathematical system that can be shown to be the only system on which the bee can store its honey with the greatest economy of wax. Now, what is the force behind this behavior? Does the creature do this wonderful work blindly, or does it know full well what it is about?

Major Hingston is a naturalist with a pen that is able to report all the fascination of his studies. Insects are his favorites and he has specially concentrated upon discovering what they do by instinct and what they seem to figure out. While this present story will not solve this perplexing problem it provides interesting material for conjecture in the style which has made Major Hingston's books such attractive reading.

Here we have a problem on which different authorities hold diametrically opposite views. Some would have the animal an absolute machine, a creature with no psychic qualities whatever, a mere bundle of physico-chemical forces with reactions analagous to the movements of plants. Others place it on a higher plane and give it an elaborate psychological nature. To them it is a thinking, reflecting being, governed and controlled by mental forces that differ, no doubt, in immense degree, but nevertheless are essentially the same as the mental forces that exist in man. In fact, does the creature act instinctively, or does it work by intelligent means?

There are few words that have been given so many definitions or so numerous varieties of meaning as "instinct." Most people have a clear idea of what they mean by an instinctive act. By instinct, they say, a bird migrates; by instinct a bee constructs its comb; by instinct a spider manufactures its net. They speak of the force as if they understood it. Let us, therefore, analyze it and see what it consists of. And, most important, let us contrast it with the other psychological force, intelligence.

There are three essential elements in every instinctive act. 1. An instinctive act is independent of instruction. For example, the bee, when it makes its cell, does so without ever having gone through an apprenticeship. 2. An instinctive act is independent of reasoning. For example, the bee does not plan out beforehand all the marvellous geometrical perfection which enters into the cells of its comb. 3. An instinctive act has an end in view, but of that end the creature is ignorant. For example, is the bee, when making its cell, unaware of the fact that it is building a receptacle for the purpose of storing honey?

What, then, is instinct? It is an innate force, born with the creature, a fixed part of its inherited nature. There is no calculation in it, no premeditation. It is a blind impulse, a striving in the dark, an unconscious automatic drive which must be implicitly obeyed.

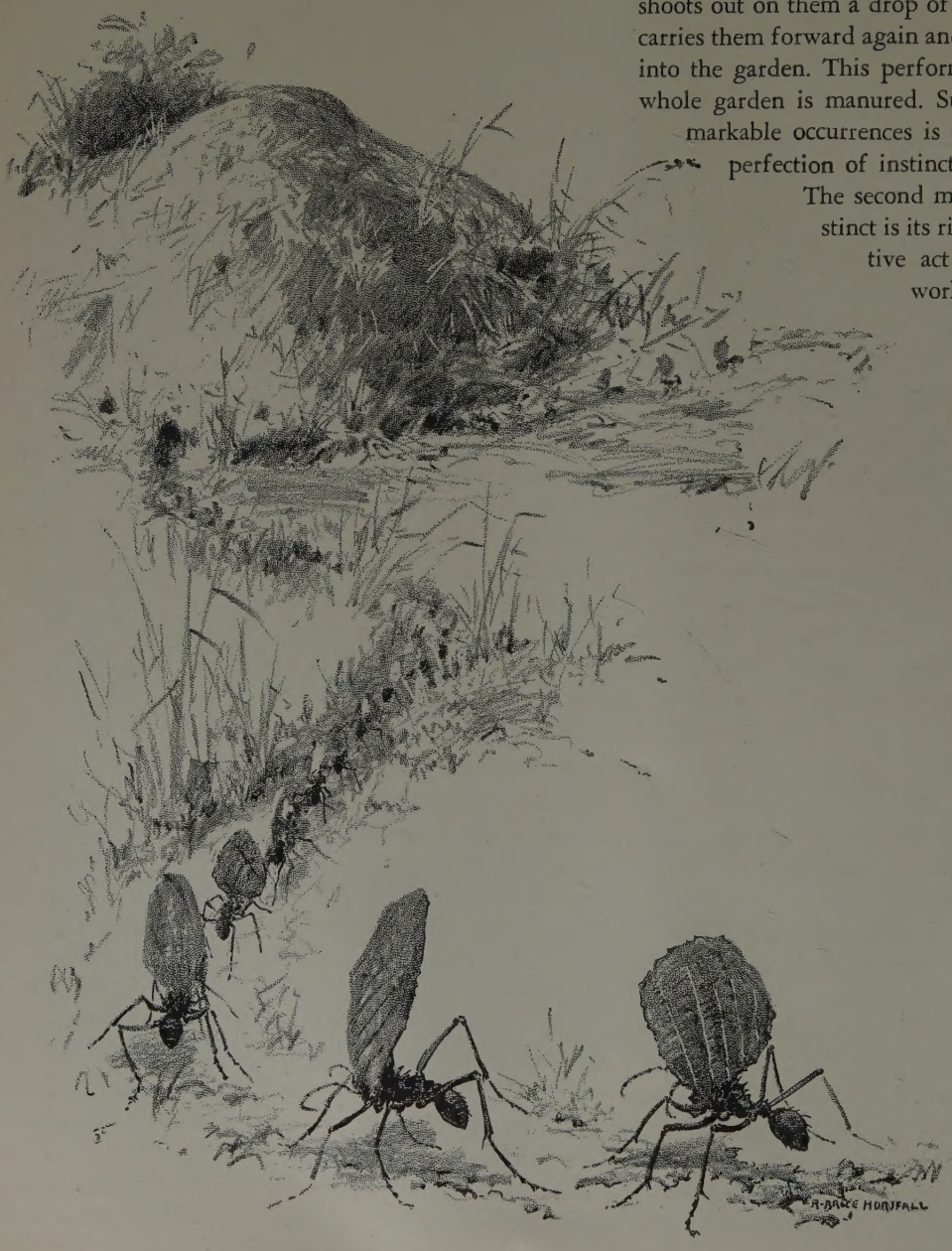
Let us now consider the main features in this blind automatic force, the evidence of which is all about.

Perhaps the most striking thing about instinct is its wonderful and amazing perfection. The honey-bee, for example, makes its cells on a plan of geometrical hexagons which a student of the higher mathematics can demonstrate to be the most advantageous possible for the bee. A spider weaves a circular net, and in doing so makes the angles, spirals and sectors all on a perfect geometrical plan.

But I will describe one case in detail. A certain ant, *Atta sexdens,* inhabits the forests of Brazil. It nests in the soil underneath a mound, and from the nest spreads out roads to places where it can collect leaves. Its business in life is to gather leaves, carry them back along these special roads and into the interior of the nest. Having got them inside, the ants make a garden of them. They convert the leaves into spongy lumps, on which they grow crops of tiny mushrooms to serve as food for themselves and their young. Now, this is a wonderfully perfect instinct. The ants have learned horticultural methods of a highly specialized type. But this is only a small part of their instinct. There is a still more remarkable occurrence when the ants come to start a new nest. The queen ant flies off from an established nest, one filled with quantities of mushrooms. She meets a male, becomes impregnated, then gets down into the soil and starts a new nest of her own. But how does she stock the new nest with mushrooms? By a method which displays the highest forethought. Before leaving the old nest she takes a mouthful of mushrooms, which she carries with her on her wanderings until she strikes on the new abode. Then she spits up the mouthful of mushrooms, cultivates the precious material by herself, lays a few eggs and brings up some larvae. Again we see how perfect is instinct and how much apparent foresight it displays. But still we have not reached the height of perfection in this particular example. For the queen, having started the garden, will fail to develop it without suitable manure. How does she manage to do this? She manures the mushrooms with her own excrement. From time to time she grips some mushrooms in her jaws, carries them back to the tip of her abdomen, shoots out on them a drop of excrement, after which she carries them forward again and presses them with her feet into the garden. This performance is repeated until the whole garden is manured. Surely this succession of remarkable occurrences is enough to demonstrate the perfection of instinct.

The second most striking thing about instinct is its rigid inflexibility. An instinctive act has an end in view and works inflexibly to the fulfillment of that end. It follows a predestined course unflinchingly, and nothing can turn it aside. It is a remorseless force that must be implicitly obeyed.

Here is an example. I have watched an enormous stream of butterflies trying to cross the Himalaya. The instinct at work was the instinct of migration. It was driving this host of fragile insects to follow a fixed unalterable course which brought them up against the Himalaya, the greatest obstacle on the solid earth. Here was an occasion to test inflexibility. What will



GATHERING LEAVES FOR THE GARDEN OF THE ANT DOMICILE

Once in the nest these will be converted into spongy lumps on which will be grown tiny mushrooms to feed the young of the ants

these delicate creatures do when they impinge on this tremendous barrier? One would say, of course, "they will swerve to one side; they may flutter about aimlessly for a while, but soon they will realize the utter futility of trying to surmount these icy ranges and will then sheer off on some other course." But that is just what instinct refuses to permit. Their migration is destined to a definite direction, and nothing, not even the mighty Himalaya, can alter that instinctive course. See the butterflies, how they behave; they are coming in thousands along a low valley, dancing over the fields, threading their way amongst the groves of trees, but always advancing in the same direction, going steadily to the northwest. They strike the range. But the stream continues without defiection, it begins to ascend the wooded slope still keeping to the northwest. Up they go, without hesitation, without deviation, hundreds passing every minute, higher and higher on the steep slopes. Where are they going? Above them is line upon line of ranges, covered in ice and draped with glaciers, and rising to over 20,000 feet. Nevertheless, up they go and reach the highest limits of the trees. I follow them still farther, and watch them leave behind the last wisp of vegetation, flutter upward over the barren rocks and out over the sea of ice. On they go as far as I can see them, and disappear amongst the glaciated peaks where, perhaps, they are totally destroyed.

In this we see well the inflexibility of instinct. The innate instinctive migrating force is given to the creature for a particular end, namely to drive it in a definite direction, in this instance to the northwest. But let anything interfere with that instinct; obstruct the migration with the greatest barrier imaginable, still the instinct will continue rigid and inflexible though it drives its possessor to complete destruction. In this case myriads of butterflies may perish rather than swerve to the right or left.

The third point that strikes us with respect to instinct is its amazing degree of wisdom. All its actions are directed to some end, and all work in logical sequence in order to attain the fulfillment of that end. Again an incident will demonstrate the point.

In the deserts of Asia there are venomous animals whose habits are in the main nocturnal. One is a huge

THE WASP MAKES USE OF A HAMMER

Grasping a small stone, it carefully tamps down the earth it has placed in a hole that hides its larder

hairy spider-like creature, quite as large as a man's outspread hand, and usually known as a solifugid. Another is an immense black scorpion, five or six inches in length. Now, these two creatures fight terrible battles while prowling over the desert by night. Their contests deserve the closest study. The two huge creatures come together. They face one another. Then there is a fierce and sudden rush. The opponents clash, the scorpion with its tail raised ready to strike; the solifugid with its hairy arms pushed forward in order to receive the impact of the rush. The two clash. Then they spring apart. More clashes follow, more springings apart, because neither can get in a decisive blow. Then we see force giving way to strategy. The solifugid, having failed in its forward operations, directs its assault to the enemy's rear. It turns away from the scorpion's head and fixes its attention on the scorpion's tail. It soon gets completely absorbed in this maneuvre. It is filled with terror and loth to strike, but nevertheless keeps firmly concentrated on the sting that projects from the enemy's tail. All of a sudden there comes a pounce. The solifugid makes a spring, incredibly swift, hurls itself upon the scorpion's tail and grips the base of the sting in its jaws. The repulsive creatures twist and struggle; the scorpion tears with its

SOLIFUGID OUTWITS SCORPION

Many fierce battles are fought between these two but the hairy, spider-like creature has a resource of fisticuffs that often outwits the enemy when it is successfully executed

claws at its opponent. But the solifugid never flinches. It has mastered the deadly weapon and just clings like a bulldog to the point gripped. Nothing will force it to let go its hold until the sting has been ground in pieces. Then, having robbed the enemy of its weapon, the solifugid withdraws victorious from the battle.

Now the point about this fight is the instinctive wisdom of it. The solifugid clearly knows the position and danger of its enemy's weapon. It understands that the way to conquer its opponent is to work to the rear and fasten on the sting. But the point is, how has it gained this knowledge; from where has it obtained this remarkable understanding. It cannot be knowledge gotten from experience, for one fight with a scorpion means death to the solifugid unless it knows the lesson of the sting. There can be no question of learning from experience; for either the solifugid knows the lesson and lives, or it does not know the lesson and dies. Also I have tested the point experimentally by rearing a brood of young solifugids and putting them up against small scorpions with the result that they knew the scorpion's danger-point though they had never seen a scorpion before in their lives. Thus here we have a remarkable wisdom. The creature has not learned it; it has been inherited; it is a wisdom that has come from generation to generation, and which every individual of the species possesses and which all perform with the same perfection in exactly the same way. It is an intuitive, instinctive wisdom, unlearned and untaught.

As an offset to this wonderful wisdom it is possible to give several illustrations which, if we did not examine them closely, would appear to be acts of incredible folly.

The best example of this apparent folly is that splendid observation of the French naturalist on the endless chain of processionary caterpillars. Fabre followed out the habits of these creatures. They move through the trees in long processions, one following immediately behind the other with its head touching its predecessor's tail. The whole procession winds about in a long continuous string.

USING LARVAE TO STITCH UP THE NEST

Ants cannot make silk but the larva must to spin its cocoon, so, with a supply of thread on hand, the ant presses the half-developed young into service

In order to keep the string unbroken the caterpillars manufacture a kind of road. Caterpillar number one in the line plays out a thread of silk which he allows to dribble behind him. Caterpillar number two crawls along this thread and pays out also a thread of his own which strengthens the thread of number one. Then comes caterpillar number three. It does exactly the same, crawls along the thread behind number two, and adds another thread of his own. This goes on throughout the whole procession until by the addition of all the threads the caterpillars have a silken road. By means of this road they keep in the procession; it is a physical connecting bond; all are linked together by a thread. Fabre's experiment was made to determine what the caterpillar procession would do if he made their road into a closed circle. By this means he would bring about a new state of affairs. He would do away altogether with a leader; the circuit would be completely closed. The head of every caterpillar in the circle would be in contact with the tail of the caterpillar in front of it. The procession would have neither beginning nor end.

After many attempts and many failures he at last got a complete circuit moving round the edge of a large vase. What might one expect to happen in these circumstances? One might guess that the procession would go on for a while, that perhaps the caterpillars for an hour or two would go round and round in the closed circuit, but that soon they would tire of this strange perambulation, of this futile game of follow-the-leader which always led them back to the same spot. Fabre began his experiment on the 30th of January. All that day they went round and round, and so they continued on the second day and the third day, and even kept up the endless circling for seven days and nights. The spectacle ended on the eighth day. The caterpillars had

COMMUNITY EFFORT IN NEST MAKING

The Indian red ants make living chains to draw together the leaves that are to be sewed into their nest

walked more than a quarter of a mile in their travel.

Now what can we say of this astounding exhibition? Does it not illustrate the folly of instinct? Does it not make instinct out a machine, with one wheel gripping another wheel, with the other wheel fastening in a third wheel, while the hidden force undeviatingly and unknowingly works towards some predestined end? Certainly the exhibition seems amazingly foolish, but what it really demonstrates is this. That every instinct is given to a creature for the fulfillment of a particular end. When the instinct is applied to that end it works with astonishing perfection. For example, the thread of the processionary caterpillar is a highly perfect instrument for keeping the procession in an unbroken line. But when we alter the course of this instinct; when we try to make it do something else other than what it was originally intended to do, then the instinct refuses to submit to our interference. It works on in its predestined course oblivious of the changes that we try to effect in it. Hence it can be made to perform acts which strike us as the height of folly.

Turn now to intelligence. Here we have another psychological force which contrasts sharply with the force of instinct.

An instinctive act is an inborn impulse; it is something which the creature has inherited from its ancestors, something which it brought into the world at birth. An intelligent act is an acquired character, something which the creature has gained in the course of its individual life. An instinctive act is independent of experience; the individual did not secure it by education. An intelligent act has been gained by experience; the individual has learned how to carry it out. An instinctive act is independent of reasoning; the individual does not think out how it is done. An intelligent act is a logical process; the individual reasons out how to do it and understands the steps in its course. An instinctive act has an end in view, but of that end the individual is ignorant. An intelligent act is filled with understanding; the individual knows why it is being done. Instinct, in act, means blindness and ignorance; intelligence implies recognition and choice.

We will now consider a few acts of behavior which cannot be included in the category of instinct. They are not routine acts in the life of the individual, but special deviations from ordinary behavior for the purpose of meeting some special contingency with which the creature happens to be faced. They are acts which imply the procession of intelligence in addition to the instinctive force.

One of the best is Peckham's wasp. This wasp belongs to the group of diggers. Its business in life is to dig a burrow, then go forth and capture a caterpillar, paralyze the caterpillar with its sting and drag it into the burrow. Its last act is to close the burrow by filling the hole with earth. Now, let us concentrate on this last step, the closing of the burrow after the caterpillar has been pushed in. The ordinary instinct is very simple. What the wasp does is to shuffle in earth until the burrow is completely filled, and then scrape the surface about a little in order to hide all trace of the spot. That is the simple closing instinct. It is the plan adopted by all members of the species. We may say that shuffling and scraping are the elements of this instinctive act. But what did the Peckhams one day observe? They saw a wasp of this particular species, behaving in a way quite out of the ordinary. It had elaborated the closing operation, had made a very unusual deviation, a distinct improvement on the ordinary plan. It began in the orthodox way by shuffling earth into the burrow until it was filled level with the ground. Then came the extraordinary deviation. The wasp picked up a small stone in its mandibles, carried it into the filled-up mouth of the burrow and there used it as a hammer to pound the earth into the hole. It used its hammer rapidly and powerfully, and kept at the job until the ground was level. This is an example of an intelligent deviation in the direction of an insect making use of a tool. It cannot be classed as a case of instinct. It is not the instinct of these wasps to hammer. Their instinct is merely to shuffle and scrape. The hammering was the invention of a special individual, of a genius, so to speak, in the race of wasps. It broke away from the petty shuffling and scraping; it did something better; something higher than instinct; it rose above its strict intuitive impulses; it did something new, something original, something different from the routine that its parents had imparted to it. In fact it behaved intelligently, and must have known full well what it was about.

Another class of acts that have more in them than instinct are those in which numbers of individuals cooperate in order to secure some complicated end. One of the best illustrations that have come under my notice is that of the Indian red ant, which stitches leaves together with silk. These ants make a nest as big as a football in the foliage of a large tree. The nest is made by pulling leaves together and then stitching their margins with silk. We will first consider how the leaves are drawn together. It it done by a very ingenious method. The ants stretch their bodies across the gap between two neighbouring leaves. They grip the edge of one leaf with their mandibles and the edge of the opposite leaf with their hind legs. Then they pull with all their strength until the edges of the leaves meet. The operation is fairly simple when the space between the leaves is sufficiently narrow for single ants to span the gap. But often the gap happens to be broad. Then the ants cannot close it by just stretching across; they have to link themselves in pairs or in chains. One ant grips another by the waist. By this means they almost double their length and can stretch across wider gaps. If this is not enough they make themselves into chains, each one gripping another by the waist until the full space is spanned. Then they all pull together, all side by side, all parallel to one another, all with their heads directed towards one leaf and with their hind legs turned to the opposite leaf; it is like a party of well-disciplined men applying their efforts to a common task. The gap lessens; the edges of the leaves come closer together, and under the steady uniform strain the space becomes completely closed.

Then comes the second part of the performance. The

edges of the leaves are in contact with one another; they must now be stitched together with silk. How is this done? Ants are not creatures that are able to make silk. If they want this valuable substance they must get it from some other source. What they do in this case is to get it from their larvae, the half developed young in their own nest. The larvae require silk to make cocoons for themselves, but the ants now impel the larvae to yield up their silk for another purpose; namely, to stitch the leaves of the nest. While the leaves are being held in position by the ants, another ant comes forward with a larva in its jaws and sets about the business of stitching the leaves. It holds the larva just behind the head and lowers it from time to time until it touches the edge of the leaf. While the larva is being lowered it spits out silk and anchors a filament at every spot where it is made to touch the leaf; the ant swings the larva from side to side, first touching one edge with it, then the other, and the larva as it moves spreads out threads which end by firmly uniting the leaves. It is a remarkable and fascinating sight. Indeed there can be few more instructive observations than the way these ants make use of their young to generate these connecting lines.

Now can we explain all these many adjustments in terms of blind instinct? The ants have to make such a crowd of adaptations. Should they pull as individuals or in pairs or in chains? How should they adjust themselves with respect to the leaves, to their number, to their shape, to the spaces between them? We cannot explain all this by instinct. Instinct certainly is the main force, but in addition there is something else. There is a ray of intelligent appreciation illuminating the whole act.

Thus we have in these humble creatures the two forces, instinct and intelligence, existing side by side. Instinct, without question, is the dominating force. It is innate and automatic and the creature must strictly obey its commands. We have seen that it is a force of amazing perfection, that it acts in a rigid inflexible manner, that the end it makes for is wonderfully wise. But these creatures are not wholly instinctive. They possess some intelligent activity also. The force is feebler and less perfect than instinct and affects the small details of behavior rather than the main acts. These two forces, instinct and intelligence, are always blended in the animal mind. They never separate completely from one another. Their existence is evident in the scale of life as low at least as the realm of insects. For myself, I believe they exist everywhere right down to the lowest forms of life and that there is an unbroken psychological continuity which runs right through the whole animal kingdom.

• • •

ODD FRIENDSHIPS

BY S. F. AARON

On the good, old principle that "a friend in need is a friend indeed" strange attachments sometimes spring up between creatures totally unrelated and having no inclinations in common.

Friendships between horses and dogs are not unusual, each plainly desiring the company of the other, which is more to be wondered at in the horse than in the naturally affectionate canine. Stranger is an evident understanding between a horse and a rooster, the latter, wanting sufficient power to make himself cock of the walk, turning recluse in part and finding in lonely Dobbin an apparently like-minded independent. It could not have been that the flies that bothered the horse attracted chanticleer, because he lacked deftness in catching them. It may have been that the grasshoppers and other insects disturbed by the grazing quadruped gave the biped a chance for a titbit now and then, but what could thus influence the horse was not surmised. The two in our pasture were well-nigh inseparable, the rooster roosting on the stall partition, the horse never showing toward the bird that irascible disposition common with its kind and usual toward other horses.

A FRIENDSHIP OF THE BARNYARD

The duck kept guard while the dog slept and deftly snapped at flies that came to annoy

More easily understood was the comradeship between a gray puddle duck and a hound dog belonging to our neighbor. When the canine was not off hunting, the duck and the quadruped were always together, the dog generally lying asleep, the bird standing guard and snapping with great skill the many flies and other insects that normally bothered Ponto. This service was the chief cause for the chumminess; neither probably felt any strong personal attraction otherwise.

As easily understood was the friendly cooperation between a half-grown shoat and a lone gray goose on a western ranch of my acquaintance. The bird deftly fed upon the bugs that harassed the porker; the pig, strangely perhaps, overcame its naturally gregarious inclinations and forsook its numerous fellows to wander off with old Anser. Rooting about in the prairie soil the quadruped would actually, quite un-piglike, pause, draw back and permit its friend to gobble certain unearthed titbits.

SEED PARACHUTE OF THE MUSK THISTLE
This photograph, magnified ten times, shows in detail the means Nature takes to see that the seeds are well spread

MUSK THISTLE—FLOWER OR WEED?

BY J. G. PRATT

ILLUSTRATED BY THE AUTHOR

WHY DO we spurn the lowly thistle? If it grows at all it does so of its own volition for one seldom hears of its being planted like other flowers. It is universally classed as a weed, and that means an unsightly, useless or noxious plant that grows to the disfigurement or injury of others.

The musk thistle, *Carduus nutans*, sometimes erroneously called the "Scotch thistle," is not unlike others in the same family, and might be injurious in a row of corn, or even unsightly in the same vase with glads or roses; but if allowed to grow in some far corner of the garden, away from the walk and the children's playground, it too may find its place in the sun.

The story is told that long ago, during a Danish invasion of Scotland, when a party of Danes attempted a night attack upon the Scotch encampment, one of them stepped upon a thistle and uttered such a cry of pain that the Scots were awakened and forthwith repulsed the invaders. Ever since then the thistle has had a high place in the affections of Scotland; and on account of its bright blossoms and ready defense against those who would injure it, it was chosen as their national emblem.

The spines are so sharp that they will penetrate one's clothing at the slightest touch. They are actually sharper and their shafts more slender than the finest needle. Little wonder that the Dane uttered a cry of pain when he stepped on one.

There are many species of thistle in the United States,

some native and some immigrants from the Old Country.

The entire plant has a quaint sort of elegance, with its queer shaped leaves and long bare stems supporting the flowers. These latter are inclosed in a coarse woolly case, green on the outside and covered with spreading spines. They are globular in form and are noticeably pretty when the purple or magenta flowers come bursting through. The flowers are soft and silky. After these are withered the heads become big downy balls of seed, which are the favorite food of the goldfinch

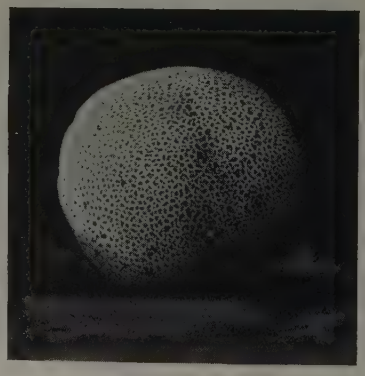
Nature is loath to allow any of her happy family to become extinct, and never ceases in her fight for self-preservation. And while the progeny of the peony and the rose might be left to the desires of man, those less favored with beauty and fragrance are provided with their own method of propagation. The seeds of trees are carried by the birds, to find lodgment along the fences upon which they alight; while the spores of ferns are blown about by the winds, and so also the thistle, whose seed is furnished a tiny parachute which floats on the softest breeze until it comes to rest upon a friendly nook, there to raise its brood.

MUSK THISTLE, BOTH FLOWER AND SEED

Though often classed as a weed it is worthy of better attention and adds a touch of interest to some garden corner

• • •

HARD-SKINNED PUFFBALLS



Another article in the group on the hard-skinned puffballs

BY DR. WILLIAM A. MURRILL

THE SMALL hard-skinned puffball is an attractive, speckled little species not uncommon in the United States. It occurs from early summer to late fall on the ground in open woods and thickets from Massachusetts to Florida and westward as far as the state of Wisconsin. It is rounded, and between two and three centimeters in diameter. The base is tapered, forming a short stalk; the skin is thinner and more flexible than the other species. It is a pale yellowish-buff and densely covered with small angular scales of a darker color, which give it a speckled appearance. The interior is purplish and not very solid; the spores dark brown ellipsoids with sharp spines, and escape through an irregular mouth as in some true puffballs. Although the skin is tough, it is not as rigid as in most species, and the puckered mouth on the top of old plants reminds one of the true puffballs.

THE BIRD THAT EATS LAST

THE CARACARA, SCAVENGER DE LUXE

BY C. J. PENNOCK

ILLUSTRATED BY R. BRUCE HORSFALL

WE WERE camped on the north bank of one of the most meandering creeks in lower Florida, about four miles from a southwest indent of Lake Okeechobee. The evening meal was being consumed while the sun went down over a savannah that stretched its arms out toward it, and the shadows deepened in the mudholes and stagnant ponds. Our interesting day was ending.

"Look," said Frank, "your bird is seeking you out."

Sure enough, over the savannah he came, large, robust, deliberate in flight, with all the grace of the National Bird—the caracara, for the study of which I had been struggling through mud and swamp all day. My heart gave a fillip. I had hunted birds for years, but this was the first time my subject had ever come to me.

He alighted, and calmly surveyed the situation, found the offal from our meal, and proceeded with the business of his call. We could not help but admire him, despite his taste in food. His erect posture, his bare legs, unfeathered face and huge blue-based bill, capped by a dark horizontal crest and set down into a broad, white collar gave him a most judicial, austere mien.

He was alone only for a short while. Before long we had as many as fifty black and turkey vultures and five or six more of his own kind. And then we learned his own position among the scavengers. Like the serfs in the feudal estates, he had to sit at table "below the salt." The black vultures drove him and his kind away, and sated themselves. Then the turkey buzzards took their turn, with the caracaras hovering about and snatching a bite whenever they could. They came last, and a poor last it must have been. But they did not complain, and when night fell, went off to distant roosting places, there being no trees about, and returned early the next morning, ready to take their turn.

In addition to their striking appearance, the caracaras are interesting because their range is closely restricted in the United States. In the states east of the Mississippi, as a general rule, they are found only in Florida south of the 28° parallel and they appear west of the Father of Waters only along the southern international boundary. They are rarely seen in New Mexico and California, as they seem to shun the rougher, higher altitudes. In the Everglades state, they frequent the open prairie country or the borders of timbered tracts, where their diet, auxiliary to carrion, and consisting of rats, mice, hares, frogs, small alligators, lizards and other small animals, is most easily obtained. They are much more catholic in their tastes than their associates the vultures who, by the endowment of short blunt talons and gallinaceous like bills, are not fitted for the capture of living prey.

The birds are known locally as "Mexican buzzard" and "Mexican eagle", the first probably from their associations, and the second because of the grim aspect given them by the prominent bill. "Caracara" is derived from a Mexican-Spanish root word indicating the supposed

greedy appetite of the creatures. Such birds are hearty eaters.

They are usually rather wary, yet at times they will remain on a perch and permit an observer to pass within a few yards without taking flight. Such lethargy may be following a heavy meal, and quite often is revealed in open country beside a highway. When aroused to flight, they appear, perhaps, to their best advantage. They fly with slow, steady wing beats in a deliberate, royal manner, and occasionally mount high in the air to perform graceful soaring evolutions that would arouse the envy of even the best of aviators. Even at considerable distances the piebald markings of black, rusty brown and white, which become more accentuated with the older birds, may be plainly discerned.

We were in Florida too early to observe the nesting of these birds, but it is an open secret that they choose a cabbage palmetto for a breeding site. The long leaf-stems are pressed down and a considerable mass of sticks and grasses placed thereon form a rude platform, not a substantial built-up structure as do the eagles and ospreys, but like those species they may continue to occupy the same nest for successive years. The eggs are in great variety of colors from very dark chocolate or almost black, through varying shades of brown into pinkish and to almost pure white; this latter being quite a rare occurrence. They are more nearly round than are the eggs of our vultures and so more closely resemble in form the eggs of our eagles. They rarely lay more than three eggs and rear but a single brood in a year.

There are no figures by which the present caracara census may be compared with their numbers in years past but the older hunters and trappers insist they are decidedly fewer than they were twenty or thirty years ago and that the growing scarcity is due to wanton shooting by visiting gunners. Whether or not this be true it is rare indeed to hear of a native hunter killing any of these carrion-feeding species. Neither do these same men bother to use sanitary measures in caring for any dead animals, knowing that they will be promptly and effectively disposed of by vultures and caracaras.

• • •

THE LARDER OF A BUTCHER BIRD

BY CARL KREBS

As I was wandering one day through a copse of hawthorn bushes, a small object hanging in one of the trees attracted my attention. On approaching closer and examining the object, I saw that it was the body of a white-footed deermouse, suspended securely by being wedged into the crotch formed by two small twigs. I had chanced upon the store of a butcher bird, the northern shrike.

The northern shrike is one of several species popularly called butcher birds. It is their custom to hang prey not wanted for immediate use in a tree, either pierced on a thorn or wedged in a tiny crotch.

They are all inhabitants of the northern hemisphere, and the common European species, at least, received the name that has reference to its meat-hanging habits long before America's birds had been studied, and probably before America's existence was even suspected. Many ingenious theories have been invoked to account for this habit. Some have contended that the suspended victims are merely baits to decoy others of their kind within reach, for, it is pointed out, some are never eaten. But we shall not be far wrong if we consider the collection, for a convenient thorny twig may hold a row of grasshoppers or crickets, with here and there a bird or a mouse, merely as a storehouse of provisions. In all probability the shrike thinks that later he will eat each item, just as we must attribute such intentions to the nut-burying squirrel.

Long ago some called the shrikes "nine-killers", for it was believed that just nine victims each day was the invariable quota, but in times of abundance we doubt whether so small a bag-limit of grasshoppers would satisfy a hunter of such proven ability as this master of the fields. And as the leaner days of autumn are succeeded by the still more precarious times of winter, perhaps times are sometimes hard, even for a butcher, who already may have taken from his hooks the last dried-up grasshopper. But when the storms come and snow covers the field let us hope that our little butcher's larder will provide for the proverbial rainy day that may come, sooner or later, to the best provider.

A PLANTATION OF CINCHONA IN JAVA USING THE TERRACE METHOD

This country has built the business of supplying bark of these trees for the manufacture of quinine into an important economic factor in which it has nearly a monopoly

BARK AND BITE

THE STORY OF CINCHONA AND THE MOSQUITO

BY ERNEST ELWOOD STANFORD

SLENDER evergreens approaching one hundred feet in height, with large, thick, glossy-green leaves and a flower-cluster presenting at a little distance a somewhat lilac-like aspect, the cinchonas command the respect of the landscape-gardener, though limited by their tenderness to the tropics. They are natives of the mixed forests of the slopes of the northern Andes. To see cinchonas in any considerable number today, however, one must travel to an island almost diametrically opposite on the globe. Gone from the scattered abundance of the South American forests, they now gather in military lines on the terraced hillsides of Java. There thrifty Dutchmen, aided by fertile soil, complaisant climate, and busy brown-skinned laborers, have built up one of the most successful plant-product monopolies in all horticultural history.

The reason lies not in the artistic beauty of the evergreen—a difficult thing to "cash in" on anywhere, and as Java is a far-off corner of the world "very few people pass that way." Although the cinchonas are botanical relatives of the coffee-tree, the dry fruit with its small winged seeds has no beverage value—quite the contrary, probably—and is certainly not edible. The attractively formed leaves are never seen in commerce, and the timber appears to be quite unknown to the craftsman.

The bark of cinchona, brownish in hue and gray-flecked with lichens, might well be the last part of the tree to attract attention. A casual taste of it, however, stimulates sluggish interest into hurried search for water, because cinchona bark is of intense and exceeding bitterness. The bitterness is chiefly due to quinine. Quinine is the one almost sure cure for the evil consequences of the bite of certain mosquitoes.

Malaria, carried by certain mosquitoes, still ranks, as it has ranked through all human history, as one of the greatest disease scourges of the tropics and near-tropics. In spite of years of combat against it, the annual malarial loss to the British Empire alone has been computed—insofar as loss involving suffering and death can be estimated in terms of money—as between 52,000,000 and 62,000,000 pounds. In the United States proper, where malaria occurs in much smaller territorial limits and where the struggle against it has (we like to think) reached a general efficiency not attained elsewhere, the annual penalty of the disease has been estimated as enough to cover the entire cost of the American Navy.

The early history of cinchona is somewhat misty. That the Incas of Peru knew of its value has been asserted and denied. Primitive peoples not infrequently possess some knowledge of native plants having physiological activity, and their medicine-men often accompany incantations to drive off disease with bitter and nauseous potions. Barbaric science, nevertheless, is more likely to be concerned with lethal potions and with arrow- and ordeal-poisons than with the arts of healing. The Peruvians of Pizarro's time, however, were not so much inferior in intelligence and culture to their European conquerors. Whatever their primitive chemistry, it had not yielded them gunpowder, and the vigorous use by

WHAT IT LOOKS LIKE
A bit of the bark, at the left, and the leaves, flowers and fruit of the cinchona tree

the Spaniards of that popular medieval means of persuasion and conversion considerably estranged those Indians who were left alive. Therefore it would not be remarkable if the Incas failed to share with the white men a matter of knowledge more precious and more easily concealed than the visible silver and gold which the galleons bore to Spain.

One picturesque tradition shows us a fever-racked Spanish missionary, prone in the Peruvian jungle. Near him lies a tiny pool of stagnant water. Painfully stumbling and crawling, he reaches it at last. Faugh! It is nauseous and bitter—poisoned or bewitched, perhaps. But the fever burns. Death stares him in the face. Thirst wins. He drinks his fill, and drops back exhausted by the pool. Presently he rises unsteadily. The fever is leaving him! Puzzled, he stares at the stagnant water. If bewitched, it is with the white magic and not the black. His clearing vision notes a dead tree-trunk submerged in the pool. Its crumbling bark mingles with the bitter waters. Science as well as superstition stirs his mind. Doubtfully he tastes that bark. Alone in the jungle, this unknown Spaniard makes the greatest medical discovery of medieval time—perhaps of all time. Pizarro wrecked a civilization and enriched Spain for a century. This casual, haggard, nameless subordinate injured nothing and for all time enriched the world.

However came the knowledge, Spaniards in Peru certainly used cinchona before 1640. The Countess of Chinchon, wife of a Spanish viceroy, is said to have experienced its benefits and to have taken it back to Spain about that time. Almost simultaneously, Jesuit missionaries, returning, made known the bark to the older continent. Under various names—Countess's Powder, Jesuit's Powder, Cardinal's Powder, Peruvian Bark, and China-China—the latter a Peruvian vernacular name—the medicinal became widely known. Its virtues were acrimoniously debated by physicians and laymen. There were sufficient reasons for differing opinion. The identity of malaria as distinct from other fevers was not thoroughly understood. In those days of dubious commercial ethics, doubtless much of the high-priced "Peruvian Bark" had never seen South America. At that time, particularly, anything so distinctly associated with either Catholic or Protestant became an immediate object of suspicion to the other faction. One noted physician, moreover, declared that if this speedy and efficient cure for fever came into general use, the medical profession would be ruined. Probably he was not alone in this viewpoint.

By the early nineteenth century, nevertheless, cinchona had established itself in the treatment and prevention of malaria. Increasing demand threatened the supply of the South American forests, once deemed inexhaustible. Collection of the bark was wholly in the hands of natives who, whatever the status of their ancestors, had sunk quite to barbarism, and who had no wish or ability to bring the tree under cultivation, or even to conserve in any way the vanishing wild supply. Often the trees were not even cut down, but merely stripped to the height of a man's reach and left to die with the major portion of the bark wasted. Cinchona, in fact, became quite exterminated in the more accessible regions, and even in remote mountain fastnesses the supply began to run low.

About the middle of the last century, therefore, the

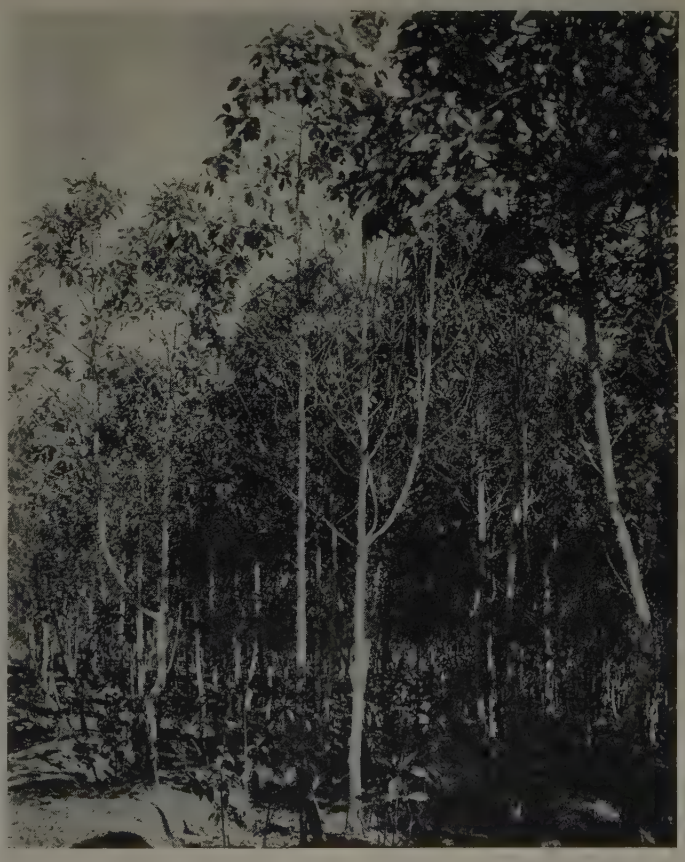
A CINCHONA ESTATE RUN BY THE GOVERNMENT IN JAVA

This shows the luxuriant growth of the valuable trees in the foreground and the buildings of the station in the background. There are two species of cinchonas planted here

depletion of cinchona supply had two important lines of result. One William Henry Perkin, aged eighteen, was among those who conceived the idea of manufacturing quinine, and thus freeing the malaria world from its dependence on South America. That was in 1856, and in the years since many more mature chemists have wrestled unsuccessfully with that problem. Bill Perkin failed, but in his failure he laid the foundation for the tremendous development of coal-tar chemistry, with its triple ramifications of dyestuffs, explosives, and medicinals—not including quinine. Not an unimportant consequence of the legendary thirst of the traditional Spanish missionary.

At about the same time, European explorers in search of cinchona seeds or seedlings began to appear in South America. They met with a variety of difficulties. Governments objected to the export of material for cultivation elsewhere. Indians of the collecting region proved dogs-in-the-manger, unwilling to practise scientific barking, but quite willing to bite those who designed to take elsewhere their profitable vegetable product. Of many explorers who went in, some failed to return, and some, who braved tremendous difficulties to get into the almost inaccessible region of production, "bootlegged" out material which proved to be worthless after all their effort. Of the host of cinchona species and natural hybrids, only a few are of real value, and these the white men found it difficult—opposed as they were by the natives —to identify in the field. Seeds proved short-lived and seedlings delicate.

Cultivation, too, proved no easy matter. The tenderness of the cinchonas barred them from the United States and most other regions where horticulture had reached a high plane. Climatic, soil and altitude requirements proved exacting. At one time or another, however, the production of cinchona on a commercial scale has been undertaken in tropical regions by the principal colonizing powers. The Dutch in Java, surmounting all sorts of obstacles with traditional Dutch grit, were the pioneers of success. Their fortune was due in some part to the Englishman, Ledger, who carried to Java what is now known as *Cinchona ledgeriana,* a species which combines high quinine yield with what may be called in one word "cultivability." Today Java (with smaller amounts from adjacent Sumatra) supplies more than ninety percent of the world-supply of cin-



A VIEW OF A JAVA PLANTATION

The trees are thinned out and replaced by young ones, enabling what is known in forestry practice as sustained yield

chona, under conditions of cooperation and manipulation of the world-market which have rendered the Javanese trade a matter of no small profit, while supplying the medical demand, at a reasonable price as compared with other medicinals of similar derivation.

Production elsewhere is now of comparatively little importance. Ceylon at one time dominated the world-market—to her sorrow, because unregulated production about 1887 "broke" the price so disastrously that the Ceylonese have since preferred to specialize in tea. India produces considerable amounts, but all, and more from Java, is used in that teeming country in the never-ending war against malaria. Ex-German colonies in Africa have small plantations, and Uncle Sam in the Philippines, in a quiet way, is seeing what he can do about it. It seems unlikely, however, that the Javan monopoly will be seriously threatened in the near future.

The chemist, of course, threatens Java from another angle—his usual one of synthetic substitutes. Not so much is now heard of endeavors to manufacture quinine itself. But if the microscopic parasite which causes malaria can be killed in the blood-stream by quinine, why should it not be equally susceptible to something else—preferably, of course, something lacking the bitterness and certain other undesirable attributes of quinine, and producable in large quantities at a profit to someone? The physician, being interested in results rather than in substances or sources, lends an attentive ear when the chemist suggests "something new," and tries it out in his careful fashion. It is quite within the bounds of possibility that any day may see the genesis of some "synthetic" that may make quinine as obsolete as cupping and bleeding. Only, a good many days of arduous experimentation have passed without seeing the genesis of any such thing.

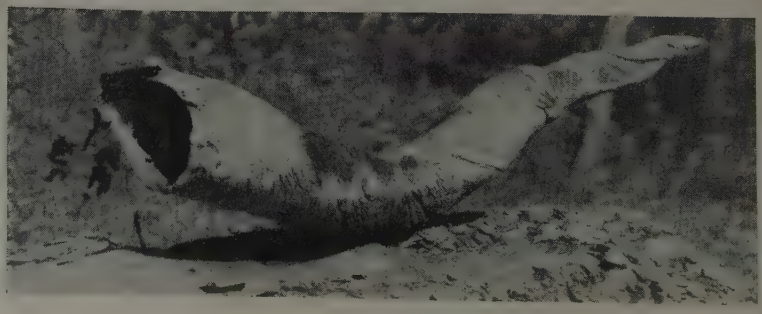
The mosquito—the villain Anopheles, is vulnerable, of course. If you don't know Anopheles, observe the next mosquito that comes to rest on your person—or preferably somewhere else. If she lights with her body nearly parallel to the object of her attention, there is no danger of malaria. If she slants down at a sharp angle and seems to observe that object attentively—then look out! Of course, if she never bit anyone suffering from malaria, she is harmless. But if she did, she very likely sucked into her own anatomy certain living things which, after going through certain stages for which the "insides" of Anopheles seem to be the only suitable environment, come out again in the salivary secretion when she bites another innocent bystander, with resultant disaster. It is all rather complicated, but there is no guess-work about it. Science has checked every step.

Prevention, of course, is the best cure for malaria. If you can dry up the stagnant pool where Anopheles breeds, or cover it with kerosene, or scatter a little Paris green over it from your morning spin in your airplane, you may never need to know whether quinine is sweet, sour, or bitter. But until the last Anopheles is gone from this ball of earth, mud, and water, the people who inhabit it may well be thankful to the traditional missionary, with his legendary thirst, for cinchona.

• • •

CARVED BY NATURE

In seemingly playful mood Nature often fashions fantastically. At the left, it would appear, we have a diminutive man and a specially long-necked horse. At the right is the man in closeup view, slightly disabled, one would say, but still in the ring. Below, Nature has carved a powder horn in which elves and pixies must have found hiding places.



COURTESY AMERICAN-SWEDISH NEWS EXCHANGE

TWO RESIDENT BRUINS IN THE SKANSEN MUSEUM IN STOCKHOLM

The bears roam here in surroundings that are natural to their free lives and are kept within their area by no bars but by a wide moat

STOCKHOLM'S OUT-DOOR MUSEUM

BY HOLGER LUNDBERGH

HIGH on a rocky and verdant section of the beautiful Djurgården Park in Stockholm lies Skansen, animal park and outdoor museum—a unique institution. It represents the materialized dreams of Arthur Hazelius, a Swedish patriot and scholar who lived from 1833 to 1901. On his journeys through rural Sweden Hazelius visited many quaint villages off the beaten path. But even in conservative communities he found that old customs were giving way to modern modes of life and he realized that Sweden's peasant culture would some day be lost if not preserved. Hence he wanted to assemble in one spot native costumes, tools and farm implements, and even whole houses, churches and belfries.

In 1872 he started on a collector's trip through Sweden, and by the following year he had amassed enough rare antiques to exhibit to the public. He continued to search the countryside for valuable relics and later enlarged the scope of his collection to include all classes of the Swedish people. It was his aim to display the various objects in true relation to their use or decorative purpose. Therefore, his exhibits always showed a quality of life and naturalness hitherto lacking in other museum collections.

In 1880 Hazelius donated his enormous collection to the Swedish people under the name of the Nordiska Museet, or Northern Museum. Already at this time he entertained an idea of an out-door section of the museum, but it took eleven years until his plan materialized. It was in 1891 that Skansen, a formerly fortified ridge, for the first time opened its gates to a proud and delighted public.

At Skansen it became possible for Hazelius to erect not only one but dozens of authentic farm houses, barns, stables, a church or two with belfries. The buildings, which he had transported piece by piece from Dalecarlia and other provinces, he filled with fine old furniture, kitchen utensils, spinning wheels, looms and other handicraft apparatus, books, textiles, crockery and pewter ware. The church received a beautifully-carved pulpit, pews, ancient bells and century-old bibles.

Today Skansen offers a more complete picture of certain phases of Sweden's past than any other museum or collection. Entire little villages have grown up, many provinces being represented with complete buildings.

Recently a typical manor house of the gentry was re-built at Skansen, surrounded by a beautifully landscaped garden. The house in which Hazelius was born now fittingly has its place in the living museum which he created.

To help stimulate further the interest in Swedish culture Hazelius organized concerts by village fiddlers who competed in playing old jingles on equally ancient instruments. Charming and all but forgotten folk dances were again taken up; folk plays were enacted. These musical programs are still a feature of the entertainment.

Another phase, not less important than the one just described, is the well stocked and carefully laid out animal park at Skansen. Here we find, as in most modern zoological gardens, mammals and birds and reptiles. Nearly all Swedish wild animals are represented, and some of the most popular are the brown bears. Until not long ago they were enclosed in cages, but now a new and larger reserve has been opened up for them in wooded and hilly terrain. It is claimed that this reserve is the largest in any zoological garden in the world. What adds much to the naturalness of the enclosure is that it is set apart not by iron fences but by a wide moat.

• • •

TOBY FINDS A HOME

BY ADA CLAPHAM GOVAN

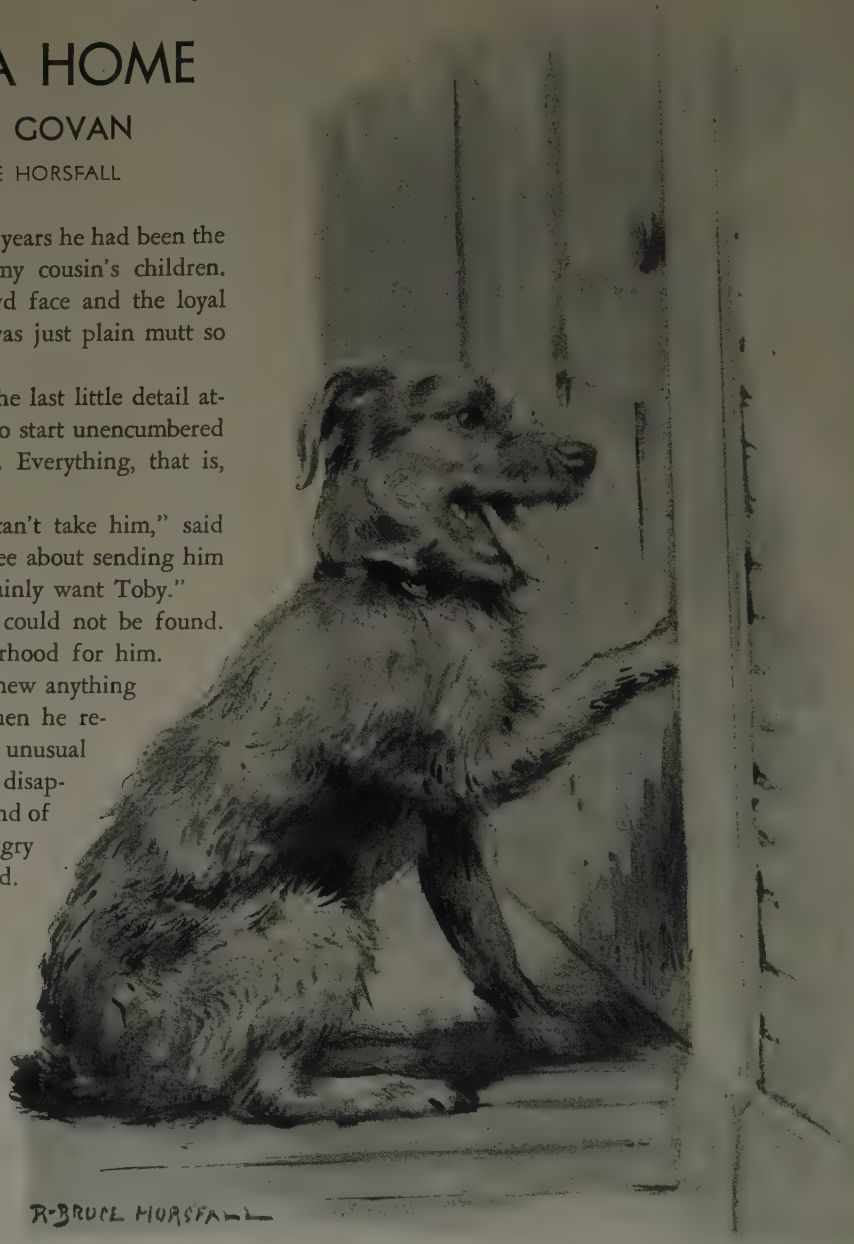
ILLUSTRATED BY R. BRUCE HORSFALL

His name was Toby and for six years he had been the inseparable companion of my cousin's children. He possessed a smart shrewd face and the loyal heart of a thoroughbred, but he was just plain mutt so far as pedigree went.

Everything had been sold, and the last little detail attended to, leaving the family free to start unencumbered for their new home in California. Everything, that is, but Toby.

"We leave in two weeks and can't take him," said Paul, "so tomorrow I'm going to see about sending him to the League. Somebody will certainly want Toby."

When the morrow came, Toby could not be found. The children scoured the neighborhood for him. Nobody had seen Toby. Nobody knew anything about Toby for three days, and then he returned, acting as though nothing unusual had happened. Two days later he disappeared again, only to return at the end of another three days. He wasn't hungry and seemed to be perfectly contented. The entire family was mystified.



They opened the door for him next morning because he seemed uneasy, and Donald was all ready to follow the dog when he went down the steps. Across the field and under the fence they went. Don was a good sprinter and Toby was moving along at a steady trot. He seemed in no doubt as to where he wanted to go. Over more fields. The boy was getting winded but the dog forged steadily ahead. Just as Don was about to give up the chase, Toby trotted up the steps of a modest looking house, in no way different from other houses as far as Don could see, but Toby knew better. The neighborhood was an unfamiliar one to the boy, but not for the dog. He scratched at the door, which was immediately opened by a woman.

"So you've come back, old fellow?" said she. "I'm glad."

Don rapped on the door.

"Is that dog yours?" he asked the kind-faced woman.

"Why no," she answered, "but he has been coming here for about ten days. He seems to like me."

And then Don knew that Toby had solved his own problem in his own way. No League for him! He had picked his own home. But how did Toby know?

The all-seeing eyes of the wise old owl—wide eyes, wondering eyes that are themselves responsible for the mantle of wisdom bestowed upon this bird. And note the interesting reflection of the photographer in the eyes of his subject

Eyes that seem particularly to "belong" in the faces of these young barn owls—eyes that are bright and built to peer about in the dark recesses of the places where barn owls make their homes and rear their funny-faced youngsters

And here we have a strange collection of eyes. Up in the left hand corner the sea elephant looks as though he had seen something that just about scared him out of his wits. In the eye of the crowned crane making its toilet above there is a sort of wide-eyed vanity that fits well with the fancy crest. At the left the protruding eye of the bullfrog, a somnolent eye befitting the stolidity of the fellow. And below the bright and watchful eye of the young cuckoo on its nest, an eye that darts about lest danger creep up unobserved.

On the next page the shoebill stork at the top seems in thoughtful mood, while next to him we have a close-up of the

proud eye of a lion. Below the lion, the almond eye of the sea lion, an eye meant for a watery life. Above us, here, we seem to see a haughty glint in the eye of the curassow, while below there is dark fear in the eyes of the kinkajou.

CRANES OF THE ELK LANDS

SOME NOTES ON THE LIFE OF THESE BIRDS AT JACKSON HOLE

BY SMITH RILEY

ILLUSTRATED BY R. BRUCE HORSFALL

OFFERING winter home to the elk, the refuge at Jackson Hole, Wyoming, does not give sanctuary to these antlered monarchs alone. The lands include wide stretches of swampy meadows through which the broad clear waters of Flat Creek flow in a silent, meandering course. There are many springs, two of the largest located against the foot of the Butte, feeding wide streams dense with vegetation. So here many water birds find safe homes, during the season of migration and when the nesting time is on.

From a fifth to a third of these meadows comprise live water threading jungles of broad-leaved swamp grasses intermixed with tules an inch through at the base, and extensive areas of cat-tails, patches of which are six feet high in late summer. Owing to the temperature maintained by the extensive springs within a growth zone of higher altitudes, conditions make for a variety of aquatic plants and the life such plants support. Water snakes of all sizes are plentiful, while frogs of miniature size are to be seen in vast numbers.

Muskrat houses, built largely of cat-tails and peat soil, occupy many of the points and hummocks along the streams where the industrious rats have intricate systems of tunnels approaching the houses from the water. When the vision is unobstructed duck sentinels like to occupy the tops of these houses so they may give warning of approaching danger and slide noiselessly into the water or the seclusion of the enveloping growth.

The swamps are bordered by extensive reaches of higher meadows broken by swales and shallow ravines containing water when irrigation is in progress over the cultivated sections. These border meadow areas are overgrown with low rushes, skunk flower, two different kinds of plantain, and several grasses. These drier lands attract the willet, curlew, and killdeer for nesting and feeding during the breeding season. There are meadow larks and sparrows in numbers, while the blackbirds—both redwings and yellow heads—prefer the cat-tails for nesting.

On reaching the Refuge one summer during the early part of July, I saw, on several different days, a pair of sandhill cranes guiding the wanderings of two young birds that then stood well above the growth on the higher meadows and appeared to be fully feathered. In this stay of six days I rode over about all of the Refuge offering passable footing for a horse, and on all the outings, made every effort to catch a glimpse of the cranes.

On these rides I saw one of the old birds but once and in a locality where it was impossible to follow with saddle horse or on foot. I have no doubt the birds watched me closely and my failure to see the young was due to their skill in avoiding the districts over which I rode. The other times when I was fortunate to see the birds and observe them just enough to stimulate interest and raise many questions relative to their life habits, was from the porch of the headquarters in early morning and after sundown, with the aid of field glasses.

Word that this was the first pair of these attractive

birds seen with young on the Refuge since its creation in 1912, alone created a feverish hope that they might be the forerunners of a number of pairs which would, in time, use the meadows for nesting and rearing their young. Besides there were many thoughts as to when they arrived; when and where they had nested and when the young were hatched; what was the breeding area required by these birds, and how many pairs might be expected to nest and raise young on that part of the Refuge suited to them.

Several years later, through the kindness of Mr. Almer Nelson, the Refuge Protector, and his wife, I was again able to visit the Refuge and arrived there in the last days of March. While much of the snow had been melted over the meadows by a previous thaw, the weather was cold with hard winds and flurries of wet snow every day or so. Feeding of the elk was still in progress and continued until the first of May.

The first curlew was seen about April 12 on the east end of the Refuge where the higher lands were more free from snow. Mr. Murie, of the Biological Survey, making a study of the elk, saw and heard the first pair of cranes April 17. Soon after this date we experienced a four-day storm of heavy wind and wet snow, much of which melted as it fell. As far as I was able to ascertain the cranes remained on the Refuge where there is little growth offering shelter from the sweeping cold winds, and must have secured food around the springs. Meadow mice appeared to be quite plentiful during the spring of 1928 and these may have been a source of food to the birds in the stormy weather.

In the bright weather that followed the single pair of cranes became quite active and was heard calling in early morning or near sunset. On these bright days it was not uncommon to see them circling high overhead when the sun was near the zenith. Though being unable actually to see the birds, I judged, from the character of the notes of the constant early morning calling, that these were the conjugal activities preceding the choice of the nest location, the building of the nest, and the laying of the eggs.

In the third week of April the birds displayed an inclination to frequent a section of the lands about half a mile from headquarters, where a shallow ravine in the higher natural meadow drained into a partly submerged cat-tail area extending a mile or so to Flat Creek. At this time growth of the previous season offered no obstacles, so the birds could be seen as they moved over the area.

One morning while watching a pair of cranes between the hours of nine and eleven as they ranged slowly over a dry portion of the meadow, I saw one of the birds, judged from its actions to be the male, cease feeding, stretch its neck and point its bill more or less straight up, call twice and then draw down its head and stand in a huddled position for at least five minutes. Then it suddenly became alert, stretched its neck and extended the bill straight up and sprang into the air for a distance that appeared to be at least five or six feet. The wings were not opened in the upward movement but were spread as the bird descended. This upward movement was repeated three times with a slight interval between each motion, then the bird jumped to the right, extended the wings and thrust the head forward as it progressed. This movement was repeated to both right and left at intervals, several times, and then executed forward three times. I had never seen cranes do anything like this.

Never before had I seen either bird or animal move with the grace and apparent ease with which this crane executed its movements. There was something spiritual about it, as if this creature was receiving volition from outside its body, displaying no apparent effort. The mate continued to range slowly at a distance of about a hundred yards, and, as far as I could judge by action, took no interest in the activities of her partner, which had excited me to a high degree. Could it be? Had I seen a sand-

hill tomcrane dance? I hoped so with all the intentness of my being. There raced through my mind all readings on the subject. I was in no state to judge.

After standing quiet for at least ten minutes, the crane I thought to be the male started feeding slowly towards its mate and when fairly close the two stood erect and called. Another pair of cranes were approaching from the north and called as they sailed down and came to rest some two hundred yards from the pair on the meadow. There was a decided difference in the appearance of these two pairs of birds. The ones I had been watching appeared blue gray, or slate gray on the middle back and upper sides between the ends of the wings and the tails. The general effect was a gray color with a shade of blue, while the late arrivals, appearing no different in size, showed a decided cast of brown or red brown in the lower back and rump feathers. After the birds had walked about and called several times, though showing no inclination to approach closely, the gray pair arose from the meadow amid much calling and flew away northward.

During the last days of April the remaining cranes were seen to frequent a location in the cat-tails not far from the edge of the higher ground. About the first of May one of the birds was seen to stand at intervals of twenty minutes to three-quarters of an hour in the same place the birds had been frequenting for the past several days, while the other crane ranged at some distance on the higher part of the meadow. I feel confident the eggs were laid and incubation had started at this time.

In the days following, at mid-morning and mid-afternoon, the crane feeding at a distance, after spending some time dressing its feathers and standing about, would approach the nest while the bird incubating would stand up and move off when the mate arrived. As the time lengthened the frequency of the intervals at which the incubating bird stood up on the nest grew less.

Toward the last of May it was thought safe to approach the nest to determine the conditions in its immediate surroundings. There was known to be a heavy seepage to this vicinity when irrigation was in full swing on the cultivated land, and there was fear the cranes' nest might be inundated. The incubating bird remained on the nest until Mr. Murie had approached within fifty feet, then flew up with effortless movements but made no sound until it alighted at some distance where its first calls were answered by the mate. The nest was found to be a platform or raised surface of dead cat-tails three or four inches above the water. While Mr. Murie took a picture of the nest and the two beautiful eggs the birds walked back and forth at a distance of a quarter-mile, calling and now and then picking up water soaked pieces of cat-tail which they would throw into the air over their heads.

On Decoration Day it was noticed that the birds were no longer to be seen exchanging places and confidences at the nest, but were calling and flying at a distance. After a wait of some days the nest was examined and the eggs found cold and addled. For ten days the birds ranged the meadows and high lands together, never failing to express disapproval by calling or throwing debris into the air if I happened to come within observation. I am sure they held me responsible for their troubles. After this but one bird was seen at a time and I earnestly hoped a second nest had been constructed and incubation was under way. In the fall two young cranes were seen in the vicinity of the Refuge and this reawakened the hope that they were the crane children of the pair whose first nesting activity had failed, and that in other years they might come to the meadows in spring, and, who knows, help to bring back to our west a fair abundance of crane population.

• • •

TREE RESENTS USE AS SIGN-POST

BY C. A. LOVELL

• • •

• • •

It is not often that a tree finds an opportunity to show its contempt for a human desecrator; but the subject of this sketch not only found such an opportunity but made good and successful use of it.

The tree is a cottonwood, one of many bordering a small pond near Hutchinson, Kansas. Formerly the site was a favorite spot with picnickers. Then a new and less sympathetic owner acquired the property and a metal sign warning all to "Keep Out or Take the Consequences" was nailed to a tree at the edge of the grove.

Several years have passed and in the interval the tree has been busy covering the sign with bark of its own growing. The words of the warning now are all but illegible, as can be seen from the photograph, and in a short time the sheet of metal probably will be entirely hidden from sight.

STAGNANT POOLS PRESENTED THE FROG STORY

It was there, from eggs to full-grown croaker, and many hours were spent watching the tadpoles absorb their tails

NATURE SHOWS THE WAY TO PEACE

HOW INTEREST IN HER MARVELS TOOK WAR OUT OF WARFARE

BY ANNA C. PACKARD

WHEN the Bok peace prize was offered many plans were submitted but only one received the distinction of being read before the House and thus becoming a part of the *Congressional Record*. This plan's very simplicity placed the great responsibility upon the mothers and teachers of the world. There is at least one group of mothers qualified by experience to see merit in this plan. They have discovered that a Nature Club may be an effective means of directing play into channels which make for permanent peace. And play is a vital factor in education.

When July of 1914 lifted the curtain upon the World War, none of these mothers had any idea as to how far it might reach. Least of all could they dream that a lowly caterpillar would crawl in on the excitement bred by the war in a faraway land and aid in curing some of the resulting hatred.

CHRYSALIS OF THE MONARCH BUTTERFLY

Its finding brought a craze for larvae that they might turn into chrysalids in captivity

One sunshiny morning Mrs. Paul (which isn't her name at all) was having her usual walk in her garden. From the nearby lakeside cottage came sounds of battle. She reached the scene of combat just in time to wipe oatmeal from the windows and furniture, and, dodging a barrage of flying ammunition, to pick up the scattered toast. Armistice negotiated, the children went about their boating and swimming as usual. Luncheon brought renewed hostilities. Now these children were no models of deportment, but the present state of war was puzzling beyond precedent.

During the afternoon, the order, "Keep away from this camp if you know what is good for you!", gave the key to the

situation. The children had sworn allegiance to the army of their choice, building sand forts and branch breastworks, just as the Allies and Germans were doing. The Paul children were divided between the two camps. Supportable in the open, the house was too small for a German and a Frenchman —as, indeed, even Europe was rapidly proving to be.

The bed-time stories that night were interrupted by the shouts of the "outdoor enemy" demolishing the forts, and mother realized that the spirit of the "miniature war" was very similar to that dominating in Europe. The early quiet of the next morning was shattered by the warfare. Most of the mothers considered the war highly amusing and the forts clever, but Mrs. Paul, whose home was the only one so divided, thought she saw that unless a common interest could be found, there was danger of the friendships of many summers' association being broken.

As she worked in her garden, she called the children's attention to the unusually large number of tiny red spiders hurrying about to find undisturbed portions of the soil. As the oldest boy came to her she said, "See the arrowhead I just found, Eugene."

"Not in your garden? How come?" he exclaimed.

"Why, didn't you know that this was a famous Indian battlefield during the days when Mr. Astor carried on his Wisconsin fur trade at Green Bay?" his mother asked, surprised.

That was a fine beginning, and soon all that could be seen was the black soles of four feet speeding up and down the beach with the invitation to the first meeting of the Utowanna Nature Club.

Two o'clock that afternoon brought all the campers with closed fists, no weapons, angle worms and cabbage worms crawling out between fingers as though eager to be noticed. After the serious business of the election of officers—the children having these responsibilities—each showed his or her specimen, and told what it was and where found. The material was naturally varied, and an interesting meeting took place.

The meetings continued every week and every camper was there—the dues being a contribution in the form of a new specimen of bug, stone or flower. The unperishables were kept to make up a museum, and the walkables or flyables were freed after their story had been told by their captor. As there was no appointed leader, the lessons just came or were accidently happened upon.

Mrs. Paul found the chrysalis of the monarch butterfly and that brought a craze for them. Every cottage became the home of one or more larvae in a glass. Most of them took kindly to their new homes, and in due time changed from the creepy caterpillar to the jade, jewel-like chrysalis, from which emerged the butterfly before the children's enchanted eyes, though one mother did once remark, "I wonder how much longer I'll have to watch where I step, and brush worms out of the beds."

One morning our brightly-colored and striped creature started to meet the great change that meant a new life for him by crawling deliberately up the slippery sides of the glass until the cardboard cover was reached. Then, for a day and a half, he hung suspended like a question mark, or a letter J, and as though someone had sewed him to the cover. He seemed motionless, no change being detected until the next day, when the lovely jade color began to look so dingy that we feared he was dead and overripe. Luckily we kept a close watch, for as easily as dawn drifts into daylight, a milky film covered and enveloped our quiet pet. Then, as imperceptibly as death comes, he seemed to shorten and the film to harden, much as though he had been dipped into a paraffine bath; and then, in less time than it takes to tell, the beautiful gold buttons appeared, and we saw the marvel: the transformation of a caterpillar into a jeweled jade "earring," which hung for a

THE MONARCH UNFOLDS ITS BEAUTY

What seemed to be a black, velvety worm twists and stretches itself into its true loveliness and flies away

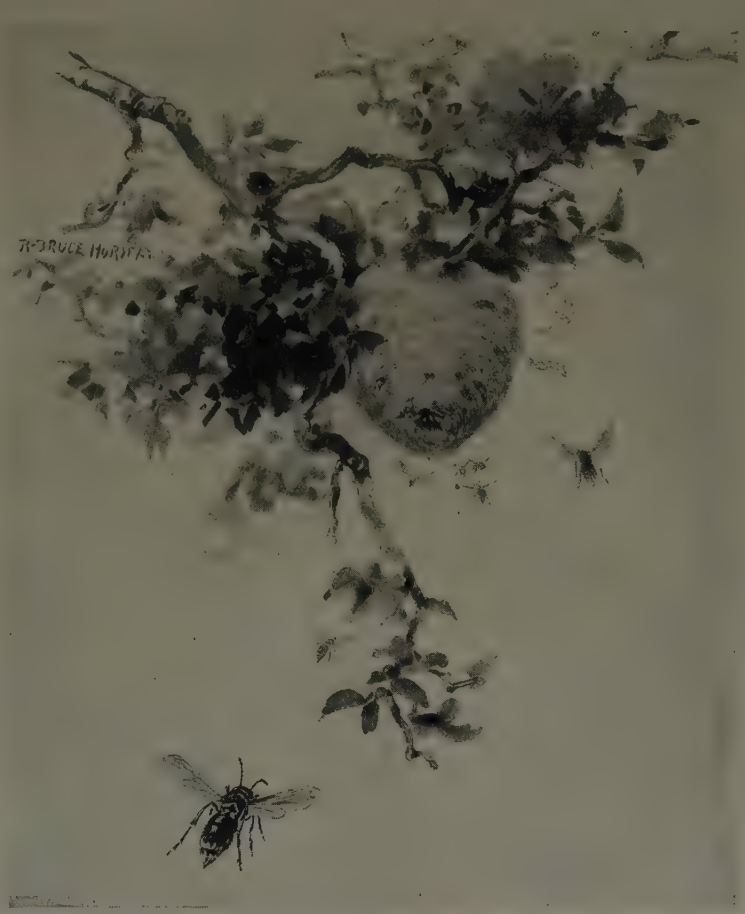
week, until the lovely green chrysalis too began to look dingy, and again we thought that our pet had died, not knowing that the time for further development was at hand. And almost at once the green shell cracked across and a black velvety worm with four long legs pushed itself out. It lay quietly on the twig of a milkweed like a tangle of chenille fringe. We picked the twig up very carefully and carried it with its worm hanging on by the wobbly legs, and put it on a bush in the sun. There took place a twisting and stretching, for what looked like fringe was really the edges of wings all folded up to get into that small home that had held them for a week. A bit of stretching and drying made them workable, and away flew our butterfly, having accomplished part of its mission by making doubts vanish into wonder at the ease with which a crawling worm can be changed into a marvelous flitting creature.

A morning walk along a railroad track back of the cottages, besides revealing a rich field for frogs, blackbirds—red-winged and yellow-headed—cat-tails, and other treasures, brought the cry, "Whose ping-pong balls?" In a moment each dirty hand held what looked like a battered ping-pong ball. "I guess Mother Turtle can best answer that," and sure enough, there was the snapper that had just left her nest of twenty-six eggs in the warm sand.

Stagnant pools presented the frog story from egg to full-grown croaker, and many hours were spent watching the tadpoles absorb their tails. A morning's walk to gather cat-tails to be used for torches resulted in a lesson on bees, one boy being the hapless subject on whom the bee lit when he left his clover. The cry of "I'm stang! I'm stang by a bee!" came to the party on the track, as a white head was being carried by two dirty feet at a greatly accelerated speed toward the cottage. Later his mother found him there brushing the back half or hot end of a bee from his swollen heel. And Karl was asked many times if the bee lost his stinger in the demonstration, but he only said, "I don't know, you go and get stang if you want to find out all about bees and stingers."

The weeds and grasses gave up their stories, and the finding of hyssop in the back yard made the story of the Hebrew bondage so real that the next morning saw a dozen children with hyssop to see how easily it would serve as a paint brush with which to spray door-post and lintel.

Each week brought a new meeting, and made us keep our eyes open for new wonders. A grape arbor attracted a flock of migrating cedar waxwings, and, though beautiful, they proved themselves gluttonous enough to behave in a silly and seemingly drunken manner. The afternoons were spent with gold beetles and bind weed, potato bugs, orioles, finches, wild honey, and lettuce that thrilled us by being a thistle.



PAPER MAKERS OF THE HAPPY LAND
And the children left them there undisturbed that they might go on with the marvel of their manufacturing

So it went on until summer was nearly over, and then the children said, "Let's have a meeting at 'Happy Land'"—a name that they had given to the Indian's Valley of the Moon, ancient site of the ceremonials of the Calumets. In a short time, to serve a peaceful purpose, branch breastworks were piled into canoes, and again "The Valley of the Moon" was to be made a place of ceremonial, as the roaring fires for the roasting of corn and wienies testified. Then, in that magic hour before dusk when waters and winds die down to peace, the roaring flames gave place to glowing coals and the fragrance of marshmallows filled the air, as did the smoke of the Calumet's pipe of peace many years ago. Those who have "eyes to see" might have discerned the God of "Green Pastures and Still Waters" as he slowly came up the bank after a refreshing dip and stood for a moment looking off across the lake into the setting sun which sharply silhouetted the stacks of the mills in which human paper makers were hard at work. Then, turning slowly, he joined the children's group saying, "Is this Utowanna Beach?"

"No, sir," chorused the children. "That is where we live. This is the Valley of the Moon, but we call it Happy Land because we have such good times here."

"I must be going," and as he turned away, Josephine of the discerning eye and ear took his hand and walked on with him, stopping, while he stopped, to avoid hitting a wasp's nest which overhung the path. In a moment she was back, all excitement, the words tumbling over each other to be said.

"I believe that was God himself," she said, "for he said as I came away, 'Go back, Josephine, and tell them Happy Land is the right name. I want this to be and remain a Happy Land for all my paper makers. They can come here to rest and then can make better paper for books like this. I am counting on your help.' So, kids, that is our job, for he seemed to mean it."

"I suppose," said Henry, "we can begin right now by burning the rest of these breastworks and letting that wasp's nest alone."

It was a thought common to the group, for all hurried to gather and throw on branches, for the burning.

The next two hours saw the rising moon and the flicker of dim lights in the cottages. Mothers tucked in sleepy youngsters, and those who took time to listen heard murmurs like this, "Some job!"

As Mrs. Paul came to Bobby's bed he said, "William's biggest caterpillar hatched today, and when he put it out on the hill he watched a while and then another butterfly came and they seemed to be loving and kissing. Maybe it was its mother."

But the more matter-of-fact daughter said, "Mother, nix. I'll bet it was his wife or sweetheart and they've set up housekeeping on the milkweeds, and we'll soon have more eggs and caterpillars to watch."

Do you think that it was a real God down at Happy Land? If not, the thoughts he left with us were God-like. That's the important thing, I think, after all.

• • •

MATERNAL INSTINCT

BY S. F. AARON

NOTHING in all Nature so completely portrays the hereditary desire to preserve the welfare of offspring as that office is unselfishly conducted by most insects. The mother butterfly and moth seek hither and yon for certain species of vegetation upon which their young must feed after the eggs are deposited on leaf or twig and are hatched. But the baby caterpillars existing as such long after the mother is dead can give her no personal satisfaction, though she strives no less for their well-being.

Life instincts demanding greater labor are shown by many of the Hymenoptera. The termites are equally instinctive in this regard. The labors of all of them are wholly directed toward the perpetuation of their several species, the propagation and care of future generations. The solitary forms never know their offspring; the social species do, yet are no more persistent in performing their duties in this regard.

Fully as remarkable are the efforts of those numerous parasites of insects, the Ichneumonidae and their allies, and the many two-winged flies, Diptera, of several natural families. Can these acts of seeking, often with difficulty, to place the eggs within the body of a strenuously objecting host, of digging deep burrows in hard earth and storing them with food sometimes obtained after hard battles and in danger, the young to hatch and develop long after the depositor has ceased to exist, correctly be called mother love?

It is especially interesting to watch Tachinid flies combat the greatest difficulties to place their eggs on the body of an active caterpillar very much on the defensive. This may sometimes be observed in *Datana,* the web-making, hairy and striped or black-bodied moth larva found often in vast colonies on walnut, hickory, oak, apple and sumac. When the full-grown caterpillar has dropped to the ground it may crawl about in the miniature jungle of long grass, seeking a suitable place to burrow and pupate, and it is often followed by swift, parasitic flies making every effort to place their eggs on the harassed creature's body. Turning, twisting, reaching far back to sweep the persistent flies aside, seizing the eggs at times in its jaws, squirming through the densest tangles further to discourage its enemies the caterpillar sooner or later becomes victim to a terrible fate. Nearly always the maternal instinct proves superior against the efforts for individual self-preservation on the part of the chosen victim.

BATTLING FOR THE NEXT GENERATION

The caterpillar of the colony web-worm moth trying to keep Tachinid flies from laying eggs within its body

GIVING COVER AND COLOR TO A PLACE WHERE GRASS IS STUBBORN

Plantings of moss pink and snow-in-summer are here used along the edge of a flight of naturalistic stone steps in place of grass

SOMETHING FOR THE BALD SPOTS

WHAT TO PLANT IN PLACES WHERE GRASS WILL NOT GROW

BY VICTOR H. RIES

THE IDEAL yard or garden is one in which no unattractive or unplanted spots exist. But we seldom find such a garden, because in almost every one there are bare spots here and there which mar and detract from the finished effect. This is just as much a problem with the old, established place as with the new, partially-developed garden. In the one we have bare ground beneath old shrubs and trees, while in the other we have spaces between the shrubs where they have not yet covered the ground. In the one the bare spots are usually in the shade, in the other, in the sun.

If these bare places are in the shade, with both moisture and plant nutrients being taken by the tree and shrub roots, we must use a special type of ground cover to grow under such conditions. On the other hand, we may have a hot, sun-baked bank or hillside impossible to cover with turf, or difficult to care for if grass can be grown. This calls for the use of an entirely different type of plant.

In addition to the places where grass is difficult to grow we find there are many in which grass could be grown but would be difficult to mow and keep in proper condition. Here again we find an opportunity to use some of the many varieties of ground cover plants. It is, indeed, surprising to find the number of spots around the average yard or garden where plants of this type not only can be used to advantage but should be used.

The major problem in the use of ground covers is unquestionably caused by places beneath the trees. Those spots are where we have tried for years to obtain a good stand of grass, only to have it dry up and disappear by fall. There even expensive shade grass mixtures have failed.

The first step in planting the shady place beneath the trees is to prepare the soil thoroughly by the incorporation of leaf mold, peat moss or rotted manure to a depth of six or eight inches to increase its moisture-holding capacity. In addition to this, an application of a complete commercial fertilizer will prove advantageous in replaceing fertility robbed by the tree roots. Several pounds of this should be scattered uniformly over one hundred square feet of ground and thoroughly worked in. Only after these preparations have been made should we attempt to plant the ground cover, otherwise we will again waste our efforts and merely have the bald spots.

It must then be decided whether this is to be an evergreen cover or one that dies down each winter. For an evergreen effect the two outstanding plants are myrtle, *Vinca minor,* and English ivy, *Hedera helix.* Both of these are superior to Japanese spurge, Pachysandra, because of their faster rate of growth, especially under dry soil conditions. For a non-evergreen effect you will find that bugle, *Ajuga reptans,* will thrive under even more severe conditions than the preceding two. In fact, it is even possible, although not usually advisable, to mow it with the regular lawn mower. Plant these plants six inches to eighteen inches apart, depending on the size of the clumps. This will give an excellent effect in a year's time.

After planting these ground covers, a mulch of a half-inch to an inch of leaf mold or peat moss will prove beneficial for the conservation of moisture and the elimination of weeds. It also does away with necessity of cultivation, keeping the soil loose and in best shape for growth.

Other plants which may be used under these same conditions are stonecrop, *Sedum ternatum;* wild ginger, *Asarum canadense;* bloodroot, *Sanguinaria canadensis;* or other native wild flowers with a tendency to trail and form carpets. We should always remember, however, that we must use only those plants that are well adapted to shade.

BARRENWORT IN A PLACE OF PARTIAL SHADE
Here this plant edges a walk. Its distinctive foliage grows from six inches to a foot in height

For shady banks that are not too dry, in addition to the above suggested materials, we may use sweet woodruff, *Asperula odorata*; forget-me-not, *Myosotis semperflorens;* or *Veronica filiformis,* a trailing speedwell.

One of our native woodland shrubs, *Euonymus obovatus,* trailing euonymus, once established is quite unusual in its effect. Here again you will find the mulch after planting, as well as thorough soil preparation previous to planting, should be carefully carried out. A mulch will also prevent erosion of the soil until the plants become established.

For sunny banks or terraces we have a greater range of materials available. The various forms of thyme, especially *Thymus serpyllum coccineum,* may be used to advantage. Various hardy pinks, such as *Dianthus plumarius, Dianthus caesius,* and the maiden pink, *Dianthus deltoides,* bloom as well as cover the ground. An all-season bloom that may be used is the mussini mint, *Nepeta mussini.* For an evergreen effect you may use the rock rose, *Helianthemum,* or some of the various forms of sedums such as *Sedum sexangulare, S. album* and *S. acre.* The moss pink, *Phlox subulata,* in its various forms, but especially the lavender, will give a thick and satisfactory cover. For gray foliage effect we may use the snow-in-summer, *Cerastium tomentosum.* For good foliage as well as blue flowers the dwarf speedwell, *Veronica rupestris,* can be depended upon.

Quite often we may desire a quick inexpensive ground cover more or less temporary in effect. For this purpose we may use some of our annual plants.

Outstanding among them all for that purpose is the *Verbena erinoides,* a rapid-growing annual with glossy dark green and finely cut foliage. This in itself would be sufficient without the small purple flowers which are produced in profusion. *Verbena venosa,* sanvitalia, petunias of the balcony type, or climbing nasturtiums, may be used. California poppies and petunias will self sow from year to year and give a satisfactory ground cover, as well as one rich in its color values.

Larger slopes may be covered with more woody materials. Outstanding for this purpose is the memorial rose, *Rosa wichuraiana.* A relatively new rose for this same use is a hybrid rugosa — Max Graf. For rougher banks we may use the Japanese honeysuckle, bittersweet, woodbine, or even matrimony vine. These larger banks may be heavily mulched with straw or strawy manure to prevent washing away of the soil, always a problem on slopes.

If the bank be dry as well as sunny, then we may select a plant originally introduced from Europe but well established in this country—the cypress spurge, *Euphorbia cyparissias;* and if we are really desperate we may even use our native horsetail, such as we find growing on railroad banks. Under severe conditions, our native bouncing bet, *Saponaria officinalis,* is not to be despised. But even these tramps among plants will appreciate the mulch to conserve soil moisture and retain all the rainfall.

Quite frequently there may be low wet spots in the garden and here we will find that the hardy forget-me-not, *Veronica filiformis, Sedum pulchellum* and *Sedum ternatum,* all of which are adapted to wet ground, will soon make themselves at home and thrive.

The narrow spaces between the walk and house, or between the drive and house often present a difficult problem due to lack of sufficient space for a really necessary shrub. Besides this, the presence of a cellar, and,

possibly, overhanging eaves make it an unusually dry spot. This calls for adequate soil preparation and enough artificial watering until the plants become established. Our old-fashioned Spanish bayonet, or yucca, is an ideal plant for such a situation. Other possible plants for evergreen effect are *Teucrium chamaedrys;* wintercreeper; *Euonymus radicans;* rock rose; *Helianthemum;* and clove pink, *Dianthus plumarius.* If it be in the shade, lily-of-the-valley or plantain lily, *Funkia grandiflora,* will prove hardy and successful under most trying conditions. In some ways the evergreen wintercreeper, under fairly good soil conditions, is the best because of its ability to climb the foundations as well as cover the ground. Try it if you have not already done so, but do not grow impatient for it takes a year or two to become established before really starting to grow.

RED-FLOWERED THYME AS TURF FOR A TERRACE

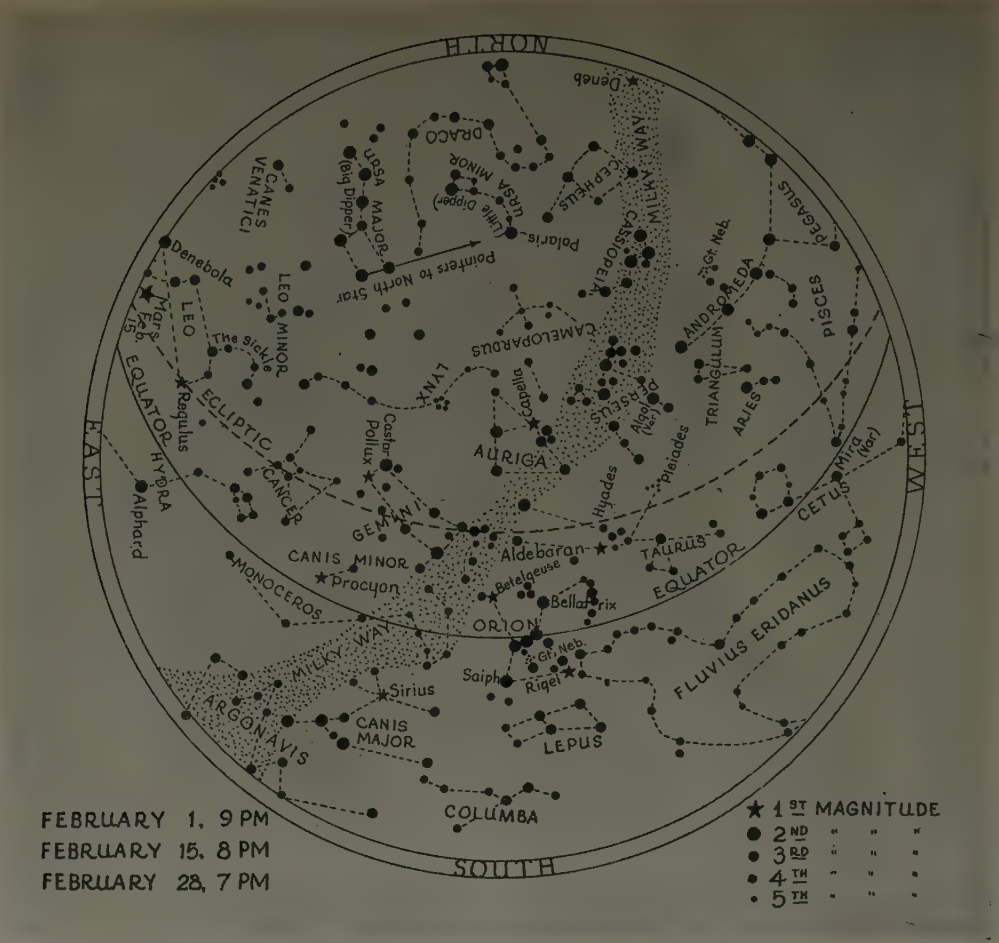
Below is a planting of Sedum spurium, which, in its various forms, is a rapidly growing and hardy ground cover solving many garden problems

The bare ground beneath old shrubs is often a problem. We may treat it as advised for the ground beneath trees, or we may use other plants such as the sweet woodruff, *Asperula odorata,* the lily-of-the-valley and the forget-me-not. If the shade be not too heavy, one of our little rock plants, *Mazus,* will provide adequate ground cover as well as a gorgeous crop of lavender flowers. If we are extremely desperate and the place is protected so that the plant cannot escape into the lawn or flower borders, then we may use our native moneywort, *Lysimachia nummularia,* but remember it is a pest and will escape if given half a chance. It has the ability to crowd out even dandelions, to say nothing of grass and desirable plants.

In the modern development of the yard where solid pavements are fast disappearing, we find that grass is not always desirable between the cracks of the stone, but that something more restricted in its nature of growth is needed. Here we may use, probably best of all, *Arenaria verna,* the sandwort, a very low, compact evergreen rock plant. It will stand the heaviest of traffic even to the extent of being driven over by autos. The various low-growing thymes give us a fragrance as well as service. If the walk be in partial shade we may use *Mazus* or *Veronica filiformis.*

Newly-planted evergreens, if set at the distance they should be, look rather alone with the bare ground between them. A ground cover planting will give them a more finished and luxuriant appearance. For this purpose we must use only those with excellent foliage and which do not become too tall. In addition to English ivy, myrtle, or if it be shady, Japanese spurge, we may use a variety of flowering plants. The moss pink, *Phlox subulata,* in its various colors is always satisfactory not only for its foliage but its bloom as well. Ground covers which remain evergreen, such as *Sedum acre, Sedum album, Sedum sexangulare, Teucrium chamaedrys,* or the miniature wintercreeper, *Euonymus radicans minimus,* may be used to advantage. Any of the other low-growing perennial or rock plants may also be used, such as rock cress, purple rock cress, alyssum, or maiden pink. These plants may be gradually removed or allowed to become smothered as the evergreens grow.

Thus we find, as we look over our grounds and garden, many spots where the use of a ground cover is essential and many other places where, although not necessary, it will add to our landscape effect and ease of maintenance. Why not take a census of these places and plan your conquest of them? It may be a little more work in the beginning, but much easier in the end. And once the bald spot problem is solved you will have pride in your work.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south

REGULUS HIDES IN FEBRUARY

OCCULTATION WITH THE MOON PROVIDES ASTRONOMICAL EVENT

BY ISABEL M. LEWIS

THE constellation of Leo, now visible in the northeastern sky in the evening hours, will come in for more than its usual share of attention this month because of an occultation of its first magnitude star, Regulus, by the moon on February 10. And it will gain further attention because of the presence of the two brilliant planets, Jupiter and Mars, within its borders and only a few degrees apart.

Although the moon passes between us and hundreds of stars every year, and temporarily "occults" or hides them from view, an occultation of a star of first magnitude under favorable circumstances is not a frequent occurrence in any one locality. This occultation of Regulus will be visible in the eastern, central and southern states, but not on the Pacific coast. At Washington, D. C., the disappearance of the star behind the disk of the moon—the "immersion," as it is called—will take place at 7:51 P.M., Eastern Time, and its reappearance, or "emersion," at 8:40 P.M. In the New England states the time will not differ greatly from that for Washington and in the central states it will occur, in general, about an hour earlier. One should not miss the opportunity to observe this interesting phenomenon if the night is clear. As the moon is full on that day the disappearance and reappearance of the star will not be as easily observed as it would be if the phenomenon occurred at the dark limb of the moon. Opera glasses, or field glasses, will be a great aid in observing the disappearance.

As to the reappearance of the star, one will probably be caught unaware because the prediction cannot be made closely enough to enable one to know within two or three seconds when it will take place. If one wishes to catch the reappearance of the star at the exact instant, it will be necessary, if the predicted time is not closely

known, to keep a close watch on the limb of the moon opposite to the point at which the star disappeared. The duration of time that the star will be hidden behind the moon varies at different places.

Occultations are observed regularly by many astronomers because they are of great importance in correcting the position of the moon. Amateur astronomers have also aided in this work of getting as many observations as possible of occultations. The exact time of the disappearance of the star to the nearest second and the accurate position of the observer on the earth's surface are the data needed to get the exact position of the moon at the time of the phenomenon. Also one must have the best position obtainable of the star. This has to be taken from star-catalogues. These positions are also corrected and improved by observations of occultations.

Aside from its value astronomically, an occultation is an interesting observation to make. As the moon possesses no atmosphere the star disappears with startling suddenness. At one moment it is seen close to the moon. Then it is gone, as if blotted from the sky in some uncanny way. Usually the star will be well away from the limb of the moon before it is seen again by even the most vigilant observer unless he knows exactly when and where to look for it. Of course the brighter the star the more interesting the phenomenon and the more easily observable without a telescope. Regulus is an excellent star for this purpose. Its position at the end of the handle of the Sickle in Leo makes it an easy object for one not well acquainted with the constellations to locate.

In addition to the occultation of Regulus by the moon on February 10, we will find close together in Leo this month the two planets, Jupiter and Mars. Here is a fine chance to observe with respect to easily recognized near-by stars, such as Regulus or Denebola, the motion of the planets with respect to the stars. At the beginning of February Mars is only about three degrees northwest of Jupiter. Both planets are moving in a northwesterly direction at this time, but Mars is moving much more rapidly than Jupiter and the distance between them widens during the month to nearly three times that amount, while their change in position with respect to neighboring stars is very noticeable.

Mars is now rapidly approaching its maximum brightness which it attains the last of this month. On February 20 it will exactly equal in brightness the second brightest star in the heavens, Canopus, which, if one is in the southern states, may be seen this month in the evening just above the southern horizon. Mars reaches opposition on March 1 when it will be on the meridian at midnight and visible throughout the night. It will be slightly brighter than Canopus the last few days in February and the first week in March. Although this is not a favorable opposition of Mars, since it is now in that part of its orbit most distant from the sun, it is, nevertheless, closer to the earth now than it will be until its next opposition two years and two months from now. Its present distance from the earth is about sixty-three million miles. This is twenty-eight million miles greater than the distance of the planet at its most favorable opposition which occurs only at fifteen- or seventeen-year intervals. The last such opposition was in the year 1924.

Mars, however, is again arousing the interest that is always its share whenever it returns to that part of its orbit nearest to us. Again there is talk of signaling to Mars, revived at each return, and speculations as to the nature of the canals and the temperature and composition of the Martian atmosphere. Astronomers, too, are now pointing their telescopes toward the constellation of Leo, and are either drawing, or photographing with plates sensitized to light of different colors, the puzzling surface markings on Mars.

Jupiter, the giant of the solar system, is now an even magnitude, or two and a half times, brighter than Mars, although at its close oppositions Mars outshines even Jupiter and is then surpassed in brightness only by Venus. There is no question of life on Jupiter. Its dense gaseous atmosphere and density slightly less than that of the sun show it to be chiefly in a gaseous state. Measurements of the surface temperature of Jupiter have been made and it has been shown that its radiation is almost entirely reflected solar radiation and that the temperature of the surface is minus 140 degrees Centigrade so that little if any heat comes up from its interior. It is believed that the many clouds in its atmosphere and other rapidly changing markings that make this planet such an interesting telescopic object may be particles of carbon dioxide or other compounds which are known to us chiefly in a gaseous state but which boil at extremely low temperatures. What is taking place far beneath the dense atmospheric covering of this planet is as difficult to discover as it is to interpret the surface markings of Mars. How great is the contrast in physical characteristics, as well as size, between these two worlds that do not appear so greatly different to the naked eye except in color and brightness! Jupiter we know to be equal to about 1300 earths in size, while Mars has only about one-seventh of the volume of the earth. Mars has two tiny little satellites. The largest, scarcely 10 miles in diameter, is distant only 14,600 miles from the center of the planet. Jupiter, on the other hand, has a large family of nine moons, the largest of which exceeds the planet Mercury in size, and the most distant of which is fifteen million miles from the planet and takes over two years to make one revolution around it. The bulk of this giant planet is greater than that of all the other planets combined. Mars, interesting little world though it is, appears like a pigmy in comparison.

Mercury will not be well placed for observation this month as it comes into superior conjunction with the sun on February 8 when it will be in line with the earth and sun but on the far side of its orbit from the earth. Saturn has just passed conjunction with the sun and so is in the eastern morning sky. It will not be visible until about the middle of the month. On February 14 Venus and Saturn will be in conjunction in Capricornus. They may be seen low in the southeast in the morning twilight. Saturn will also be in conjunc- (Continued on page 92)

JUST HOPPERS

BY MARY M. CUTTER

"Oh it's raining!" exclaimed the children. "Let's have stories!"

There were Jane and Carlyn, who were old enough to go to school; Junior, nearly six, and their little cousin-guest, Calvin, who was only half-past four.

"Well, come along," said Great-Aunt Mary. "We will go into the library." So on the davenport before the brightly blazing wood fire, which was always lighted on dreary days, they gathered.

"Today I will tell you about grasshoppers. You remember how many there were in the meadow when we were looking for goldenrod." Jane and Carlyn remembered that many of them had made great jumps and landed right on their light-colored frocks.

"Grasshoppers are very strong," continued Great-Aunt Mary. "Here is a little hopper scarcely more than an inch long and where does he jump? All the way from the end of the steps to the red rose bush fully six feet away. At that rate little Calvin could jump clear over the tennis court. Wouldn't that be funny! When Mother called him he could just jump up on the roof and hop in through the window. And if Jane was a bit late in starting to school she could hop off and in just a few hops she would be there. No need for street cars or autos. We could all go a-hopping wherever we chose."

MR. AND MRS. LONGHORN GRASSHOPPER GETTING READY FOR A HOP

"THEY JUST SLIT THE OLD ONE UP THE BACK AND STEP OUT OF IT"

"What fun to play hide-and-go-seek," said Junior. "We could hide away up in the tree tops!"

"And who knows how the hopper makes his music, if we may call it that?" asked Great-Aunt Mary.

"I know," answered Calvin. "Mother says they rub their legs together."

"So they do," replied Great-Aunt Mary, "and that is not all. Whenever Mr. Romeo Hopper wants to attract Miss Juliet he settles himself down

on his coat tails and rubs his long legs together, or maybe he happens to have his music box located elsewhere and has only to rub one of his hind legs over his 'tummy' to make music. Another kind make it by rubbing their wings together. Grasshoppers have several pairs of eyes. Two of them you can easily see but the others are hidden away from our sight. And you could never guess the funny place they wear their ears."

"Maybe on their backs," guessed the children.

"No not there, but on their *knees.*"

How the children laughed and Jane added, "I guess Calvin wouldn't want ears on *his* knees for I am sure they would be full of sand when he crawls around in the sandpile."

"Hoppers have six legs also. Two of them are the long jumpers and the other four they use in crawling about."

"Maybe they keep the old hopper from upsetting," interrupted Carlyn.

"And now for the funniest thing of all," continued Great-Aunt Mary. "When the hoppers need a new suit they just slit the old one up the back and step out of it and there they are in nice new light green pants and a darker cutaway coat. Whenever their suit gets shabby they just get another in the same way."

"Who knows something they are good for?" asked Jane.

"Oh I know, Uncle John uses them to catch sunfish," said Junior.

"And chickens eat them for dinner," said Carlyn.

"Aside from that they just hop and hop, and eat and eat and sing and sing," finished Junior.

"Just one thing more and then our story is done," said Great-Aunt Mary. "I quite forgot to tell you where the baby hoppers come from. Mother hopper digs a hole in the ground and lays her eggs in it and covers them up all nice and warm, and by and by when the baby hoppers hatch out they have to get busy and dig themselves out and just take care of themselves because their mother never bothers her head about them."

"Oh! oh!" cried the children all at once. "The sun is shining! Let's all go out and see who can find the first hopper!"

SOOKY, A GRAY SQUIRREL

BY MYRTLE BASCOM BOICE

We will never know how the little gray squirrel came to be under a bush in the Park. He was helpless, half blind, and alone when Norman found him and carried him home. But a city apartment is not the place for a frisky squirrel baby. So he was entered in the Nature room at Ethical Culture School, New York City, as the youngest member—"in a class by himself."

The new baby loved attention. Shoulder jumping seemed to be his favorite sport. All shoulders looked inviting to him, a wonderful place to sit and be admired. Or if an arm reminded him of a branch, it was jolly to run over and dig in sharp nails. This meant exciting squeals.

His table manners were not of the best. When he ate his cereal or drank milk from a dropper, he noisily and greedily sucked his food. This suggested a "sooking" sound and gave him his name—"Sooky".

Sooky had the freedom of a large sunny room and much attention. When life became too exciting, he could escape by leaping to the back of a chair, then to the floor, and run "like a streak" to safety under a desk or a cabinet. With children on the floor begging him to come out, he would sit out of reach and wash his face and tail.

Enjoy a new and greater gardening thrill from WATERLILIES, Aquatic plants, goldfish, etc., in your pool. Now is the time to plan your WATER GARDEN. It's easy. No weeds. No cultivating. The envy of the neighborhood. Brings new color, new fragrance into your life, at a very low cost.

A complete Water Garden . . . Collection No. 20

Pink Opal—Dark Pink, especially good for cut flowers.
Marliac White—A free blooming Pure White.
Helen Fowler—A popular, sweet-scented Pink.
Marliac Chromatella—A free blooming Yellow.
$4

You want this big 1933 catalog Free

Tells you exactly how to plan and build your water garden, tub or pool, what to plant, how and when. Shows exotic waterlilies, gorgeous goldfish, calicoes, fantails, comets in full color. Dozens of varieties of lilies to choose from. Catalog free East of Rocky Mountains. West of Rockies enclose 15c. Canada 20c.

Write TODAY . . .
Planting Time Is Coming Soon!

THREE SPRINGS FISHERIES
21 N. COURT ST.
FREDERICK, MD.

The Most Beautiful

SEED CATALOG FREE

Golden Gleam Nasturtium

Vaughan's Gardening Illustrated

is the year book of modern gardening, prepared by practical experts. Complete list with pictures, prices and descriptions of everything the home gardener needs or desires. It describes 2164 flowers and contains 215 true color plates of annuals, perennials, water lilies and gladioli. Lists tender, finely flavored, *table quality vegetables*, giving mineral content and vitamin value. Special 1933 offer—The New Double **Golden Gleam Nasturtium** world famous novelty, of glowing color and spiced fragrance. Ten pedigreed seeds, 10c. Catalog sent with seed or alone—FREE.

215 FLOWERS IN FULL COLOR

VAUGHAN'S SEED STORE Dept. 20
47 Barclay St., New York 10 W. Randolph St., Chicago

GARDEN FAVORITES

SEEDS 4c Per Pkt. | **HARDY ANNUALS** Over 125 Seeds to Packet | Any 9 Pkts. Only 30c Postpaid

Introducing exquisite color mixtures, PETUNIAS, LARKSPUR, COSMOS, ASTERS, ZINNIAS, CANDYTUFT, POPPIES, DWARF MARIGOLDS, and SWEET ALYSSUM White. Cultural directions and FREE Price List of Perennials, Shrubs, Roses, Vines, Berry Plants etc.

F. W. BROW NURSERIES
ROSE HILL, N. Y.

KUNDERD'S New Gladiolus Catalogue Free

Learn to your own pleasure and satisfaction why Kunderd Gladioli stand supreme. Learn, too, why Kunderd originations have won more prizes in more shows, under more judges, than all other Gladioli in the world combined. Kunderd bulbs, free from thrips and diseases, produce the finest spikes of the most perfect blossoms.

This new book describes the world's outstanding Gladioli, and tells how you can grow Kunderd introductions in your own garden. Avoid disappointments. Buy Kunderd bulbs. Prices amazingly low this year. Send for the catalogue, using the coupon.

A. E. KUNDERD, 330 Lincoln Way W., Goshen, Ind.
Please send me Kunderd's Gladiolus Book for 1933—FREE!
Name.....
Street or R. F. D. .....
City.....State.....

bring them through winter for blooming the following year. Now it is possible to secure these delightful flowers in an annual strain equally as good as the biennial, and, if sown indoors now, they will bloom in midsummer. With several sowings, in fact, one may enjoy their loveliness right through the season.

A greatly improved strain of annual lupins, new this season, is known as Lupinus Hartwegii Giants. Each plant produces from its base four to six stems two and a half to four feet tall, with much longer bloom spikes than the older types. It not only comes in dark and sky blue but also in rose and white and should become very popular.

Comparatively few gardeners know there is a "wilt resistant" strain of asters available. They have been out a year or two and come in several colors. If your soil is "aster sick" and you have diagnosed the disease as "wilt", try this new strain. Among the flower novelties in the 1933 lists is an aster of a distinctly new shade. It is a peony-flowered yellow aster with sufficient salmon in it to be named Apricot. Few garden flowers are finer for cutting than asters and these improved strains will be most welcome.

Among the flowers of summer and fall the Tall African marigolds, in spite of their objectionable odor, make a most satisfying garden effect. The nearly ball-shaped, double flowers are especially showy and now there is available a strain called "All-double" that produces nearly 100 per cent double flowers. Good strains in the past averaged about 50 per cent doubles. Another excellent new marigold is known as Guinea Gold.

When does your garden year begin? Do you have to wait till the bleeding hearts, hepaticas and early irises blossom forth, or does the wave of gayety begin with the snowdrops and carry on with crocus, narcissus, tulips and other spring glories? Of course this is not the time to plant these harbingers of spring; fall is the season for that, but unless you become garden conscious of the deficiency during the next few months, their blooming season, you will not be alive to your planting opportunities next fall. Spring should be among the gayest of the garden seasons, but if one's garden lacks bulbs, this is the time to shape plans that another spring will not find them missing.

Now I can hear some of you asking how one can make definite plans at this season. First you should, if possible, see the various kinds of early flowers while they are in bloom. Growers' show gardens, local established gardens and public parks have many of them. It is, of course, possible to plan one's planting without having actually seen these flowers because the wonderful descriptions, color plates and cultural directions in modern catalogs and books tell just how they may be used, but personal familiarity with them will help materially in planning. Next, make a sort of survey of the garden and with mental pictures of the various flowers, try to fit them into your borders. In order to make planning effective, prepare marking stakes and place them right in the garden where, next fall, the bulbs will be planted. Foliage of this season's plants will hide the stakes, but they will guide you when planting time comes. The price for quality bulbs is low and spells

Sow Burpee's Guaranteed Seeds

These special offers of some of the most popular flowers are remarkable bargains. Burpee's famous guaranteed seeds. Each collection contains the best separate colors.

Royal Asters 4 pkts. (value 40c) for 35c
Annual Larkspur 5 pkts. (value 50c) for 35c
African Marigolds 4 pkts. (value 40c) for 35c
Dwarf Nasturtiums 4 pkts. (value 40c) for 35c
Bedding Petunias 4 pkts. (value 50c) for 35c
Half-Dwarf Snapdragons 4 pkts. (value 50c) for 35c
Sweet Peas 4 pkts. (value 55c) for 35c
Giant Mammoth Zinnias 4 pkts. (value 40c) for 35c

Any four collections for only $1.00 postpaid—a wonderful bargain. Write today.

Burpee's Garden Book free
W. ATLEE BURPEE CO.
842 Burpee Bldg., Philadelphia

DAHLIAS

Look for the Trade Mark when looking for quality

For more than 45 years this Trade Mark has stood for quality and fair dealing. Stock true to name and free from disease. 1933 introductions, novelties and standard varieties. Catalog (36 pages) free.

W. W. Wilmore's Dahlia Farm & Nursery
Box 382, Denver, Colorado

I can show you how to *make a better garden*

I'll give you valuable gardening helps, learned in a lifetime of growing prize flowers, vegetables and shrubs. My Garden "How" Book has helped thousands. It will help you. I'll send it absolutely FREE with my 1933 Catalog of Seed and Nursery bargains.

Did you ever see a truly double Nasturtium? Send 25c—coin or stamps, and I'll send a packet of New "Golden Gleam" Double Nasturtiums with my FREE Garden "How" Book, Catalog and 25c rebate coupon.

The TEMPLIN BRADLEY Co.
5790 Detroit Ave. Cleveland, O.

Templin Bradley

Send VICKS *Just* 10¢

for These 3 Full-Size 10c Packets of Vicks Famous Flower Seeds

Large-Flowered Snapdragons, gorgeous colors, mixed; Giant Zinnias, brilliant colors, mixed (mammoth 4 to 6 in. blooms); Bedding Petunias, mixed.

To get acquainted, we'll send all 3 for the price of one—Send 10c today!
Vicks Garden and Floral Guide free.

JAMES VICK
131 Pleasant St., Rochester, N. Y.

OLDEST MAIL SEED HOUSE IN AMERICA

Gladioli and Dahlias

From the internationally known Salbach Gardens at new low prices. Rare, exclusive varieties of superior quality and unusual beauty for your garden. Write today for Salbach's free 1933 catalog, profusely illustrated in color to enable you to select new beauty for your garden at small cost.

CARL SALBACH
640 Woodmont Avenue Berkeley, California

STANDARD GARDEN TRACTOR

Plows
Seeds
Cultivates
Mows Hay and Lawns

A Powerful Tractor for Small Farms, Gardeners, Florists, Nurseries, Fruit Growers and Poultrymen.

LOWER PRICES

Walk or Ride—High Clearance
Free Catalog—Does Belt Work

STANDARD ENGINE COMPANY
Minneapolis, Minn. 3209 Como Ave.
Philadelphia, Pa. 2457 Chestnut St.
New York, N. Y. 196 Cedar St.

Tripod Magnifier

This magnifier consists of two double convex lenses separated by a diaphragm, in a mounting which screws up and down in the brass frame for focusing. Diameter of lens 1". Magnification 7.5x. Price now $1.25 postpaid. **EDWARD C. LYONS, 61 Frankfort St., New York, N. Y.**

real opportunity for the betterment of the garden.

The spring garden should include some of the earliest perennials. Dwarf iris, primulas, *Phlox subulata, Alyssum saxatile,* forget-me-nots, violas and many others are early and good. Most of these are rather low-growing and are not only good in the border but fit into the rock garden also. Since the advent of the wonderful viola, Jersey Gem, numerous others as good or better have been offered. Lavender Gem, Little Gem and Royal Gem are excellent and bloom not only early in the spring but almost continuously till late fall.

The new, very early chrysanthemum, Aladdin, introduced last year, blooms from August till frost. Every garden will want this and spring is the time to set it out. The Japanese mountain chrysanthemum is another introduced last year and proving quite popular. Not only is it good in the garden but it may also be grown in pots and trained into delightful cascades which is said to be the Japanese manner of growing these 'mums.

Rock gardens seem not to have lost their popularity even with the enormous number springing up everywhere. They would be much better if only their makers would try a bit more to confine their plantings to varieties obviously suitable for such gardens. There are a great number of fine rock plants which are easy to grow. A new hardy aster, only ten inches high with large violet flowers, is available under the name of *Aster farreri,* Big Bear. It should be ideal for the rock garden, blooming in early summer when it would be most welcome.

I wonder how many gardeners realize there are available seeds of more than one hundred and twenty-five kinds of campanulas? Many are wild species, native in various sections of the globe, while others are hybrids. A fine garden variety is the Peach Bell, *Campanula persicifolia,* Telham Beauty, a greatly improved form of this popular perennial, growing about four feet tall with very large lovely china-blue flowers. *Campanula garganica* is a fine rock plant and exceptionally good grown in walls.

There is almost no end to the interesting things, new and old, offered today. Modern seed and nursery catalogs are veritable mines of information and your garden book shelf should have a goodly collection. If you are shy on them, get busy at once and send for a dozen or more. Get acquainted with what is new in garden material; keep your garden up-to-date. Even if you are interested only in some special line like native wild plants, there are dealers who collect and list seeds of them. Garden information is yours for the asking, catalogs are overflowing with it, growers and plantsmen are only too willing to advise and inform you. Give them a chance and your garden will become all the more interesting.

• • •

NOTE—The Garden Department has made a survey of scores of seed and nursery catalogs and prepared a list from which the various items mentioned in the above article may be purchased. A request accompanied by a three cent stamp will bring this to you promptly.

HENDERSON'S

Special FREE OFFER

1933 SEED CATALOGUE AND 25c REBATE SLIP

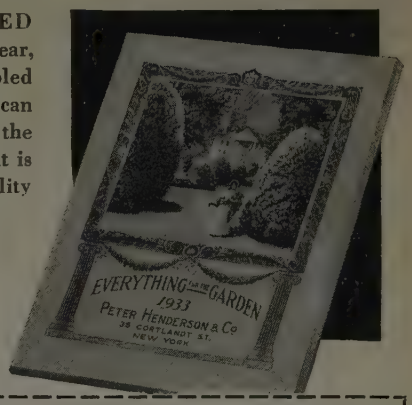
Mail the coupon and we will send you free of charge "Everything for the Garden," Henderson's new seed catalogue, together with the new Henderson 25-cent rebate slip.

"Everything for the Garden" is the title of our 1933 catalogue. It is a beautifully illustrated book with 32 full-color plates and hundreds of illustrations direct from actual photographs of the results of Henderson's seeds. It offers many special collections of vegetable seeds arranged so as to give a continuous supply of fresh, crisp vegetables throughout the summer, and collections of flower seeds especially arranged for harmony of color and continuity of bloom.

It is a complete garden book and should be in the hands of every lover of the garden beautiful or bountiful. Clip the coupon now!

The Henderson Rebate Slip, which will be sent with every catalogue where the coupon in this advertisement is sent us, will be accepted by us as 25 cents cash payment on any order of two dollars or over.

For 86 years, HENDERSON'S TESTED SEEDS have been the standard. Year after year, our constantly improving methods have enabled us to maintain our supremacy among American seed houses. The initial cost of your seeds is the smallest item in your garden's expense, and it is of advantage to plant seeds of recognized quality from a house of reputation and standing.



FILL OUT COUPON AND MAIL

Send me your 1933 Catalogue together with rebate slip as advertised.

Name .....

Address .....

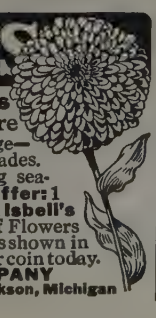
City ..... State .....

32

PETER HENDERSON & CO.

35 CORTLANDT STREET **NEW YORK CITY**

ZINNIAS



Dahlia-flowered Zinnias the new giant type—measure 6″ to 8″ across. Wide color range—many new and exquisite shades. Hardy annual—long flowering season. **Special Introductory Offer:** 1 pkt. Special Mixture—10c with **Isbell's Garden Treasures** catalog of Flowers for Spring planting. All flowers shown in nature's colors. Send stamps or coin today.

ISBELL SEED COMPANY

496 Mechanics Street (41) Jackson, Michigan

Choose from Our 75 Varieties of Beautiful WATER LILIES

These richly colored, fragrant, easy-to-grow garden flowers may be planted from April until the last of August. Ours are the largest Aquatic Gardens in America. Every root *guaranteed!* 75 beautiful Varieties from which to make your choice in our free, illustrated Catalog. Send for it NOW.

The W. B. SHAW Aquatic Gardens

Dept. A, Kenilworth, Washington, D. C.

2 STAR ROSES for ONE DOLLAR

A trial in your garden will convince you of the superiority of Star Roses. For $1, we will send you, postage prepaid, selected, star size, guaranteed plants of

★ **Grenoble** Monthly blooming (New 1932) Great, full petaled clear crimson blooms with an orange glow. $1. each.

★ **Thomas A. Edison** Monthly blooming. (New 1932) Immense blooms of two-tone pink with a yellow base. . . $1.50 each.

★ **Also**

the latest copy of "Rose News"—a periodical summary of Rose information, and

"Star Guide to Good Roses for 1933"

which lists over 200 varieties, 32 in natural colors—an authentic catalog of new and old Roses. "Star Guide" and "Rose News" sent promptly—Roses at planting time. Send $1.00 at once while this half-price offer lasts.

THE CONARD-PYLE CO., Robt. Pyle, Pres.
Rose Specialists for 36 yrs. West Grove 341, Pa.

STAR ROSES
GUARANTEED TO BLOOM

SHUMWAY'S Good Seeds

Sure Producers of Quality Vegetables and Flowers

Tested, new crop seeds, grown from finest selected stocks—sure, vigorous producers. Shumway's Seeds have sold at most reasonable prices and given highly satisfactory results for 63 years. *Extra packages sent free for trial with each seed order.*

FREE—Write today for large illustrated catalog of vegetables and flowers.

R. H. SHUMWAY
Seedsman
121 South First St., Rockford, Ill.

GARDEN BOOK FREE

Burpee's Garden Book for 1933 is ready. Write today for your free copy. It is a complete garden handbook, describing all best flowers and vegetables. 152 varieties NEW this year. Low prices. Packed with valuable gardening information. Over a million gardeners depend upon it every year.

BURPEE'S SEEDS GROW

Sow Burpee's guaranteed seeds and be sure of the most satisfactory results. Burpee's seeds have been famous for 58 years as the best that grow. They are tested for purity and vitality. Send the coupon or a postcard for your free copy of Burpee's Garden Book

W. Atlee Burpee Co.,
841 Burpee Bldg., Philadelphia.
Please send me free Burpee's 1933 Garden Book.
Name.....
R. D. or St.....
P. O.....State.....

REGULUS HIDES IN FEBRUARY

(Continued from page 85)

tion with the waning crescent moon on the twenty-second and Venus on the twenty-third.

In the early evening hours in February the heavens are exceptionally beautiful. Eight stars of the first magnitude are now in view, namely Sirius, the brightest of all the stars; Procyon, the Little Dog-star; Rigel and Betelgeuze in Orion; Aldebaran, in the Hyades in Taurus; Capella, in Auriga with Hoedi; The Kids, three faint stars, close by; Pollux, in Gemini, and Regulus, in Leo. In latitudes south of the thirty-seventh parallel Canopus, the second brightest star, may also be seen on the southern horizon, or a few degrees above it, for a short time. There are, in addition, many stars of second magnitude in view at this time. In the southeast the second magnitude star Alphard, in the constellation of Hydra, may be seen in a solitary position some distance east of Procyon. The name is Arabic and means "The Lonely One." The head of Hydra lies not far from Alphard to the northwest and is marked by a group of faint stars. They lie directly below the inconspicuous constellation of Cancer, which is between Leo and Gemini.

Orion is now in a fine position for observation, lying almost due south about nine P.M. early in February. Canis Major and Canis Minor, The Greater Dog and The Lesser Dog, follow close at the heels of the Sky-Warrior as he strides across the heavens facing The Bull with uplifted club. At this time of the year some of the stars in Argo Navis, the finest and largest constellation of the southern hemisphere, may be seen appearing above the southern horizon. Canopus lies in this constellation and is known also by the name of Alpha Argus. In February the Milky Way stretches diagonally across the heavens from Argo Navis to Cepheus, passing between Gemini and Orion, through Auriga, Perseus, and Cassiopeia. The Winter Street, Jacob's Ladder, and The Pathway of Souls are some of the names by which this beautiful luminous band of countless stars, too faint to be seen individually, is popularly known in other lands. On clear dark nights in February it adds greatly to the beauties of the evening sky. The constellation of Perseus lies in one of the most beautiful and brilliant portions of the Milky Way.

The National Tree

Through a slip of one of our two editorial typewriter fingers, we said in our announcement of the vote being conducted by the National Life Conservation Society for the selection of a National Tree, that the polls would close January 1, 1933. The seed of this interesting poll would hardly have had a chance to germinate before that date and we should, of course, have written it 1934. So there is the whole broad expanse of this new year before us in which to record ourselves for the spreading chestnut, the weeping willow, the mighty oak, the graceful elm, or what you will. Send some stamps to cover postage and get announcements and tally sheets from Mrs. Charles Cyrus Marshall, 2239 Tiebout Avenue, New York City.

That Garden of Yours

Some Timely Suggestions

Reg. U.S Pat. Off.

If you must cut down a bit on your garden expenditures, then here's a timely thought.

Cut down by all means if necessary. But at least add a few of the choice, newer things, of which our catalog shows so many.

Not the flashy novelties, of no merit. But the tried and proven new developments, that will bring so much to both you and your garden.

All of them are attractively priced for easy buying, as are all our hardy plants and rock plants.

Quality is every bit as high as ever. Prices more attractive than ever. Send for catalog. You will find it so much more than just a catalog.

Wayside Gardens

38 Mentor Ave., Mentor, Ohio
AMERICA'S FINEST PLANTS AND BULBS

Beautiful Magazine Sample Copy 10c

A favorite with amateur growers. Timely, intensely interesting, profusely illustrated. Edited by practical enthusiasts. Answers to readers' problems. Helpful hints to correspondents. Reports of tests. More facts and special information regarding flower growing than any other magazine published.

Introductory offer seven monthly issues $1.00

J.B. LYON CO., 116 No. Broadway, Albany, N.Y.

Water Lilies

1933 COLOR CATALOG FREE

Beautify large or small garden with a Water Lily Pool. Gorgeous colors, exquisite fragrance. Easy to care for. Plenty of flowers shortly after planting. California Water Lilies noted for extra hardiness and vigor. Will thrive anywhere in U.S. or Canada. Safe delivery GUARANTEED. 1933 Catalog tells how to make a Water Garden; care of Water Lilies etc. Write for FREE copy.

COMPLETE SMALL POOL $4. value postpaid $2.95

JOHNSON WATER GARDENS, Box 6, Hynes, Calif.

WIN THIS WORLD'S FAIR TRIP to Chicago. All expenses paid by Salzer's. Write for free SEED catalog and learn our easy prize rules. Best bargains in our 65 years—Northern-Grown vegetable and flower seeds, plants, nursery stock. FIELD SEEDS 99%-plus PURE at new wholesale prices. Re-selected strains, Super-graded. SPECIAL: Trial package New Guinea-Gold Marigold, 25c; Golden Gleam Nasturtium, 20c. JOHN A. SALZER SEED COMPANY, Box 297 La Crosse, Wis.

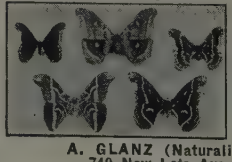
168 PAGE CATALOG

FREE CATALOG

SOW SALZER'S SEEDS

Clearance Sale of Cocoons

FREE Blue Morpho or Urania Riphaeus. Cocoons of our giant silk spinning moths. Cynthia, Polyphemus, Cecropia, and Promethea, 12 for $1.00; 25 for $2.00. Luna Cocoons 45c each, 3 for $1.15. Hyperchira io 4 for $1.00. Stigma Pupae 6 for $1.00. Free Luna on orders of $2.00 or more. Free Morpho or Urania Riphaeus on orders of $3.50 or more. Beautiful tropical butterflies from India, Africa, Java and South America in papers, unmounted but named, 10 for $2.50; 20 for $5.00; 50 for $10.00. Unnamed butterflies in papers from above countries, 20 for $3.50; 50 for $6.00; 100 for $10.00. Will get Morpho Papilios and other showy butterflies of the above assortment. Price list of entomological supplies on request. Postage prepaid.



A. GLANZ (Naturalist and Taxidermist)
740 New Lots Ave., Brooklyn, N. Y.

MIRAKEL DAYLUX BINOCULAR

POCKET PRISM NATURE GLASSES

3½ power $13 to $18; 5 power $13 to $17; 6 power $16.50 to $20; 7 power $19.50 to $35; 8 power $18.50 to $37.50. Sent on approval, post paid. We carry everything in new and used glasses. Catalogue free. What have you to exchange?

J. Alden Loring Box K-2 Owego, N.Y.

Two can live almost as cheaply as one...

$1 a day more for two persons at the Hotel Lexington. For instance, rooms at the minimum rate of $3 a day for one person, are only $4 a day for two.

And the Lexington is a new hotel, located in the Grand Central Zone, one block from fashionable Park Avenue.

HOTEL LEXINGTON

Grand Central Zone, Lexington Ave. at 48th St.
NEW YORK CITY
CHARLES E. ROCHESTER, Gen'l Manager

Colton Manor

One of Atlantic City's Finest Hotels

Fireproof . . . Sea Water Baths
Marine Sun Deck Overlooking the Ocean
Concert Orchestra

Resident Physician

Rates as low as $5.00 a day, American Plan.
European Plan if Desired

A. C. ANDREWS, President.

1933 MGS

25¢ FOR PINS-RINGS $1.25

Class pins — any letters, any year, any colors. Silver plated, 12 or more, 25c each; 1 to 11, 30c. Gold plated, 40c; sterling, 45c. Class rings, medals, etc. BIG CATALOG FREE.

METAL ARTS CO., Inc., Factory 25, Rochester, N.Y.

Massachusetts Birds

Under the title *Portraits of New England Birds,* the Commonwealth has gathered into a splendid volume ninety-two color plates of birds. These plates were originally published in the great three-volume work by the late Edward Howe Forbush on *Birds of Massachusetts and Other New England States.* The majority of the pictures were painted by Louis Agassiz Fuertes, but accidental death stayed his hand before completion. Allan Brooks lent his able talents to the completion of the collection and the present volume includes the work of both men. The ninety-two plates include some five hundred and sixty figures and represent three hundred and forty-four species. The present volume was prepared for publication by Dr. John B. May, State Director of Ornithology. But the most amazing thing is the price of this volume at $1.75. Because of this price the book is available only through the office of the Secretary of the Commonwealth, Room 118, State House, Boston, Mass., to whom all orders should be sent and all checks made payable. This is an opportunity which should not be missed.

Prices Cut

It will be of interest to all workers in Biology to learn that the Council of the Biological Society of Washington, at its last meeting, has voted the granting of a special price reduction on the following of its publications: "Natural History of the District of Columbia" by W. L. McAtee, 142 pages, inset map, octavo, paper. 1918. $1.00, postpaid $1.15; "The International Rules of Zoological Nomenclature," 28 pp. octavo, paper, 1926, 50c; "Birds of the Washington, D. C. Region," by May Thacher Cooke, 79 pp. octavo, paper, 1929, 50c. These can be obtained, postpaid, from the Society's corresponding secretary, J. S. Wade, U. S. Bureau of Entomology, Washington, D. C., at the prices indicated. Requests should be sent promptly as only a very limited number of copies remain.

Mammals

We are always interested to receive a copy of a new booklet in the group being brought out by Dr. Charles Lincoln Edwards, Director of Nature Study in the schools of Los Angeles. The latest addition to these unique texts is entitled *Mammals.* In this, as in other books, Dr. Edwards follows his program of presenting the simple fundamentals of the group with which he is treating. Here are discussed fifty-six kinds of mammals. The discussion, always simple but not restricted to the use of any particular grade, is aided by the inclusion of excellent line drawings of value to the students and of much use to the teacher in teaching the course. The booklet is printed by the Hesperian Press, 2476 Glendower Place, Los Angeles.

On the Silkworm

There is always fascination in the story of the silkworm and it has been told many times. We have not before, however, seen it told with the charm and originality given it in *The Golden Thread* by O. D. Prohaska. Here the story of the silkworm

Northland Skis

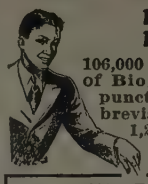
have an international reputation for quality. Whether you want skis for all-'round skiing, for racing, or jumping, you'll find a Northland model exactly suiting your needs. Ask your dealer for the skis with the deerhead trademark.

Write for "How to Ski" booklet.

NORTHLAND SKI MFG. CO.
World's Largest Ski Manufacturers
82 Merriam Pk. St. Paul, Minn.

Webster's Collegiate

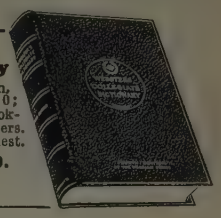
helps him to answer his own questions



106,000 Vocabulary terms; dictionary of Biography; Gazetteer; rules of punctuation; the use of capitals; abbreviations, etc.; foreign phrases. 1,268 pages. 1,700 illustrations.

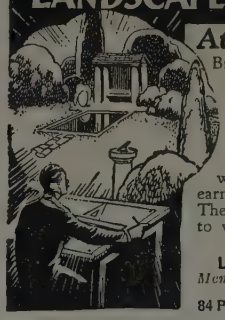
The Best Abridged Dictionary

Thin-Paper Edition: Cloth, $3.50; Fabrikoid, $5.00; Leather, $7.00. At your bookseller or from the publishers. Free specimen pages on request.



G. & C. MERRIAM CO.
273 Broadway,
Springfield, Mass.

Learn to be a—
LANDSCAPE ARCHITECT
At Home—By Mail



Big fees; pleasant, healthful work; a dignified, uncrowded profession offering remarkable opportunities. Immediate income possible. Many students more than pay for course from fees earned while studying. Graduates are earning $50 to $200 a week. The first step toward success is to write today for details.

AMERICAN LANDSCAPE SCHOOL
Member National Home Study Council
84 Plymouth Bldg., Des Moines, Ia.

Callouses
Gently Fade Away

The torturous pains of Corns and Callouses yield in a few seconds to the wonderful medication in this thin, comfortable adhesive fabric. You walk, play, dance, in comfort. No more nagging pains or tired, aching, burning feet. **Medicated Adhesive Tape** quiets the inflamed nerves and absorbs all hard growths without injury to healthy flesh. Antiseptic, healing. Big spool. 60 square inches. Send $1. and if not satisfied after trying, get full refund.

Comfitape Laboratory, Box 10, Burlington, Vt.

WANT WORK AT HOME?

Men or women earn $18. to $40. a week retouching photos without leaving home. All or part time. Clean, fascinating work. No selling or canvassing. We teach you at home, furnish working outfit and employment. Write today.

HOME STUDIOS
1950 Daily News Plaza Dept. C, Chicago

CLASS PINS & RINGS

Sil. Plate 15c ea.
Gold Fill 20c ea.
Sterl. Silver 25c ea.
Roll Gold 50c ea.

Ring R3 Sterl. Silver $1.25 each.
10Kt. Gold $3.96.
Catalogue FREE. Prompt and Safe Shipment.
ARTISTIC MEDAL & BADGE CO.
214-216 Greenwich Street New York, N. Y.

New England

SPORTSMEN'S and MOTOR BOAT SHOW

MECHANICS BLDG., BOSTON

The Sportsmen's Paradise

FEB. 4 to 11 10 A.M. to 10:30 P.M.

OPEN SUNDAY, FEBRUARY 5
2 P. M. TO 10:30 P. M.

The Wilderness Comes to Boston

A panorama of marvelous outdoor exhibits including live game animals, fish, waterfowl, birds and hundreds of other sport and educational features.

THE MOST COMPLETE SPORTS PROGRAM EVER STAGED

Fishing tackle, arms, ammunition, camps, camping outfits, motor boats, and sporting equipment in true outdoor setting

Sportsmen of New England are invited to participate in the amateur photograph and mounted fish and game sections. Every sportsman has a favorite picture or a mounted specimen that he considers a winner. These two departments open to all—no entry fee—valuable prizes for the winners. Send for entry blank.

Personal Direction, CHESTER I. CAMPBELL
Executive offices: 329 Park Square Bldg., Boston

REMEMBER THE DATES—PLAN TO ATTEND

You can renew your subscription to Nature Magazine at this great show

Up she goes . . . and up she STAYS

BY A mountain stream, at the edge of the sea, or wherever you will, your Hodgson Camp House will spring up like magic. Once up, it will withstand years of wind and weather . . . this sturdy, snug retreat to which you'll return again and again.

Hodgson Camp Houses are so quickly erected because they're shipped in sections, windows in place and doors ready hung. (An hour or two is all you need to bolt one together.) They're so strong and durable because they're made of tough, seasoned red cedar, and accurately built.

You have your choice of one, two, three or more rooms, with or without an outside porch. Prices are moderate—$150 to $500. Come and see these practical, attractive camp houses. Or write for free booklet CEA-2 to:

E. F. Hodgson Co., 730 Fifth Ave., New York or 1108 Commonwealth Ave., Boston, Mass.

Hodgson Camp Houses

THE TWIN GRIZZLIES OF ADMIRALTY ISLAND

BY JOHN M. HOLZWORTH

•

"Here we have a true to Nature account of the life of the grizzlies of Alaska, together with a suggestion of what might be bear philosophy. It is written from the viewpoint of a man who knows them and understands them."

ARTHUR NEWTON PACK

•

TWO DOLLARS

Order from
Book Department,
Nature Magazine,
1214 Sixteenth Street
Washington, D. C.

is set against an authentic background in China and becomes part and parcel of an attractively told story. The writer has combined the two threads—the one of silk, the other of romance—in charming fashion. The factual material is accurate and based on extensive sericultural experiment, while the fictional is equally authentic in supplying color. The book is enhanced by the inclusion of twelve illustrations in two colors showing the story of the silkworm. The book has been approved as an elementary school reader in California. It sells for $1.25, with special rates to libraries and schools, and is available from the author whose address is Route A, Box 271, Caruthers, California.

Boy Scout Week

Undoubtedly nothing has contributed more in a systematic way, outside of the school, to the development of the boyhood of America than the Boy Scouts of America. It is fitting that a week should be devoted to a recognition of this contribution. The week chosen is that from February 8 to 14, and in that period Scouts and Scout Leaders throughout the country will seek in various ways to call public attention to their work. Every American citizen should cooperate with them in every way that he can.

New Jersey Bird

New Jersey is still in that small group of five states that have not as yet chosen, through popular vote or official action, a State Bird. Miss Marjorie Pomerance of the Passaic Public Schools is determined, however, that something should be done about this. She has already stirred up interest, and has obtained the approval of John Spargo, Assistant Commissioner of Education, for the idea. It is hoped that through some means State-wide attention may be given to the question in the schools. In the meantime Miss Pomerance has collected and tabulated a vote in Passaic. This is interesting and now stands: Kingbird, 711; Cedar Waxwing, 295; Hummingbird, 147; Bluebird, 105; Indigo Bunting, 95; Meadowlark, 66.

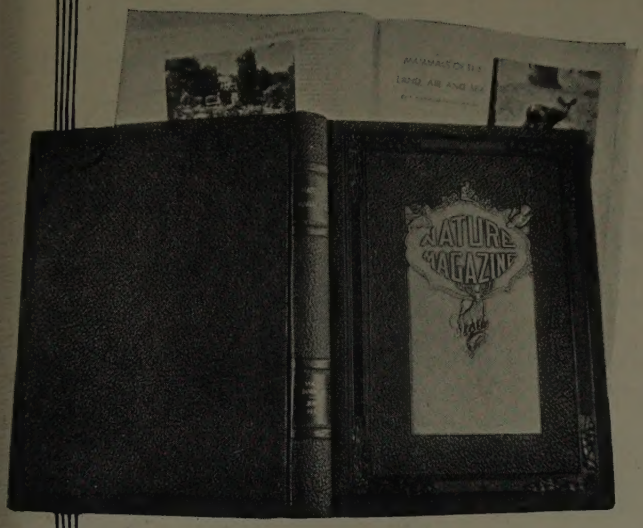
A Desert Forum

Dedicated to a program of wild flower protection—ultimately an interstate embargo on native flowers protected by law in other states—the Desert Forum has been organized in Pasadena, California. Meetings are held the third Friday of each month in the Pasadena Public Library. The president is Frank A. Schilling, 636 North Harvard Street, Los Angeles, and the secretary, Norman Brooks, 1125 Stratford Street, South Pasadena.

A Canny Bluejay

Marie M. Barteau of Brook Haven, Long Island, threw out some bread crumbs for the birds and later saw a bluejay being highly thrifty. It seems that a dozen or so apples were still on a tree in the yard. These had been frozen and so were now soft. Friend bluejay would gather some crumbs, fly to an apple and poke the crumbs into the fruit. Another trip for crumbs and another apple became a storage place. Having stuffed three apples, the jay gathered more crumbs and hopped under a low shrub, laid the crumbs down, picked up a leaf with its bill and covered his food supply. This was repeated under several shrubs. Then the jay, apparently much satisfied with itself, flew away.

AN ANNOUNCEMENT EXTRAORDINARY!



To Schools, Libraries and to all Subscribing Members in the American Nature Association who have complete files of Nature Magazine or who have a set of Nature Magazine bound volumes.

Volume No. XX Now Available

(Issues of July to December, 1932)

The publication of Volume Number Twenty marks a decade since the publication of the first issue of Nature Magazine in January, 1923. Properly indexed, bound volumes of Nature Magazine make an encyclopedia of information on Nature subjects unobtainable elsewhere at any price. They contain a wealth of fascinating stories about birds, animals, fish, plants, insects, trees, and other phases of Nature and the outdoors.

To mark the tenth anniversary Volume Twenty has been especially bound in an artcraft binding,—a handsome, finely grained, leatherlike cover, embossed in gold—a volume that will do credit to any library or reading table. In addition there is bound into this volume a ten-year index, at no extra cost.

TEN-YEAR INDEX

While each volume of Nature Magazine has been indexed, many readers have asked for a composite index.—It has been compiled and will sell separately at $1.00 per copy. Buyers of Volume Twenty, receive the index in a de luxe binding at the regular price of bound volumes.

Only $3.00

The edition is limited and no additional copies of Volume Twenty will be bound. Send your order accompanied by check today.

AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., N. W.
Washington, D. C.

CLASSIFIED

ANIMALS & BIRDS

WHITE COLLIE PUPS
the most beautiful specimens the Dog World can offer. Useful and intelligent. Catalogue.
COMRADE FARM KENNELS **Galion, Ohio**

BINOCULARS—FIELD GLASSES

BINOCULARS, FIELD GLASSES, TELESCOPES—Slightly used, $1.75 up; 8x Prism Binoculars, $11.00. All makes, DuMaurier, Busch, Lemaire, Colmont, Megaphos, etc., 3 to 24 power. World's largest assortment. Catalog free. DuMaurier Importers, Dept. 82A, Elmira, N. Y.

FLOWERS & NURSERY STOCK

EVERGREEN SEEDS, SEEDLINGS, TRANSPLANTS, for ornamental and forestry purposes. Special, 25 three-year Col. Blue Spruce $1.00 postpaid. Bargain list free. Ransom Nursery, Geneva, Ohio.

SPECIAL Introductory Offer. RHODODENDRONS. 12 Assorted clumps (Max. Catawba and Carolina), price $5.00. If order received by March 15th, will include 2 Trillium, 2 Ladys Slipper, 2 Flame Azalea. **The Three Laurels, R4, Box 91, Marshall, N. C.**

PHOTOGRAPHIC EQUIPMENT

AKELEY MOTION PICTURE CAMERA. Especially designed by the late Carl Akeley for wild life photography. Takes standard 35 mm. film. Complete with gyroscopic mount, tripod, mounts for telephoto lenses, five film reservoirs holding 200 feet each, and cases for accessories. Cost about $3000. For financial reasons must accept any reasonable offer. Address Box A, Nature Magazine.

PROJECTOR for showing Leica camera films. Practically new. Ideal for home or classroom use. Cost $49.50. Price $18.00. Address Box A, Nature Magazine.

POSTAGE STAMPS

TIBET, complete country 60c; White Russia, complete 10c. Free lists. Rialto Stamp Co., 111 W. 42nd St., N. Y.

TAXIDERMIST SUPPLIES

GLASS EYES AND TAXIDERMISTS' SUPPLIES. Largest stock in the world. 500,000 pairs of eyes to select from; finest quality; **lowest prices.** Send for complete **free** catalog **today.** J. W. Elwood, Dept. 32, Omaha, Nebr.

TELESCOPES AND MICROSCOPES

MAKE your own telescope. Outfit complete with instructions. 4"—$3.25. 6"—$4.00. FREE Catalog of binoculars, telescopes and microscopes. Precision Optical, 991 East 163 St., New York.

REAL ESTATE—RESORTS

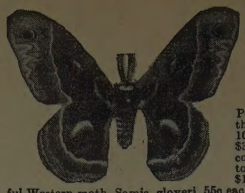
CANADIAN LANDS
SEIZED AND SOLD FOR TAXES

$ 40 buys 10 acres on travelled road
$ 67 buys 25 acres hunting and fishing
$ 58 buys 5 acres lake front
$166 buys 50 acres good farm
$270 buys 300 acres for sheep or game preserve
$324 buys 116 acres ¼ mile ocean front

Our 16th annual list just issued in the form of a 20-page booklet describes the above and many other choice properties offered at Tax Sale prices. The amount quoted is the full price asked, perfect title, no mortgage. Beautifully situated hunting and fishing camps where there is real sport; summer cottage sites; heavily wooded acreages in Muskoka, Highlands of Ontario and the New North; also farms in Ontario, New Brunswick, Quebec, Prairie Provinces and British Columbia. Now is the time to invest in Canada's minerals, forests and farms. Small monthly payments if desired. Don't delay, write to-day for free booklet with full explanation.

TAX SALE SERVICE
Room 615, 72 Queen St., W., Toronto, Canada

Free Moths With Cocoon Orders



I will include FREE on assortment orders of $2. or more, 2 unmounted moths, 1 each of cecropia and polyphemus.

GUARANTEED living silk cocoons from which *moths will emerge*, comprising our large moths: Polyphemus, Cecropia, and Promethea, assorted: 5 cocoons for $1.00; 10 for $1.75; 15 for $2.25; 25 for $3.50; 50 for $6.00—Luna moth cocoons, 70c each—3 for $1.85. Automeris Io cocoons, 35c each, 3 for $1.00. Cocoons of the large, beautiful Western moth, Samia gloveri, 55c each, 3 for $1.50. Pupae Cith. regalis $1.35—B. imperialis 85c. Papilio chrysalids, 4 for $1. Colored life histories 5 moths 35c. Indoors many emerge during Winter. Sample wings of 2 of these moths FREE with cocoon orders.

Ideal for nature study classes, kindergartens, boys' and girls' nature scout groups, schools, colleges and beauty-loving individuals. Transportation paid. Remit to

C. WM. WURSTER, Suite 1608-BC, 104 Fifth Ave., N. Y. C.

Powerful Microscope 4.98

See things you never saw before. Countless microscopic adventures with water, insects, plant life, molds, etc. Just the thing for examining signature, checks, printing, stamps, documents, geological specimens, mechanical parts, chemicals, etc. Tube can be used without base.

MAGNIFIES AREA 22,500 TIMES

Triple, precision objectives and large ocular gives fine views and range of powers. Highly polished nickel tube. Large heavy 6" base. Has slide clips and light reflector. Surpasses others selling over $15.00. Prepaid only $4.98. Money back guarantee. Order to-day.

DU MAURIER CO. **Dept 81** **Elmira, N. Y.**

New Specimen Jar!

Wonderfully Convenient.

Actual Size of Jar

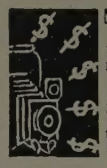
Keep your specimens safely under glass, completely visible, in perfect order.

Size of Case 9½"x5"x1¼"

50 Jars in filing case, with index card.....$2.00
25 Jars only, without case.....$1.00
Postpaid

R. P. CARGILLE
26 Cortlandt St., New York, N. Y.

Make Your Camera Pay



Magazines, newspapers, advertisers pay millions yearly for amateurs' photographs. They need more than they can get.

LEARN to make your camera pay you a good income in spare time, no matter where you are.

U. P.'s delightful TRAINING BY MAIL teaches you quickly and at low cost to make the kinds of pictures that sell.

Send for FREE Book today.

UNIVERSAL PHOTOGRAPHERS CORPORATION
Dept. 112, 10 W. 33rd St., New York City

"Such table manners!"

"I like to do tricks when Ken-L-Ration is the reward, and besides it's as pure and wholesome as the food on master's table—so why shouldn't it be served with as much doggy style as possible?"

Ken-L-Ration is made by the world's largest manufacturers of dog foods, in the most modern and sanitary plant of its kind. Cooked and canned, ready to feed. Look for U. S. Inspection legend on the Ken-L-Ration label. Sold by quality stores everywhere.

Send us a Ken-L-Ration label for Free booklet of "Auto-biographies" of dogs.

CHAPPEL BROS, INC.
117 Peoples Ave. Rockford, Ill.

KEN-L-RATION
THE DOG FOOD SUPREME

Birds from Coast to Coast

now feeding in THE BIRD CAFETERIA. Revolving. Wire glass. A garden ornament. Postpaid $2.95.

"Money-back" Guarantee

H. DERCUM
River Road, Willoughby, Ohio.
Pay postman on delivery or send check with order.

Free Squab Book

Make money breeding PR Royal WK Squabs, cream of poultry, getting double chicken prices. Raised in 4 weeks. *Send four cents stamps* for postage on new free big 68-p book, how to breed and profit 1933. Our 33rd year.

Plymouth Rock Squab Co, 704 H St, Melrose, Mass.

INDEX TO ADVERTISERS

BINOCULARS
DuMaurier Co. 96
Loring, J. A. 92

BIRD HOUSES
Dercum, H. 96

BOOKS
Bound Volumes 95
Gardeners' Chronicle 49
Merriam Co., G. & C. 93
Plymouth Rock Squab 96
Twin Grizzlies 94

EDUCATIONAL
American Landscape School 93
Home Studios 93

GARDEN & ACCESSORIES
Brow, F. W. 90
Burpee, W. Atlee 90
Burpee, W. Atlee 92
Conard-Pyle Co. 92
Dreer, Henry A. 89
Henderson, Peter 91
Isbell Seed Co. 91
Johnson Water Gardens 92
Kunderd, A. E. 90
Lyon, J. B., Co. 92
Otwell Iris Farm 89
Salbach, Carl 90
Salzer Co., John A. 92
Shaw, W. B. 91
Shumway, R. H. 92
Standard Engine Co. 90
Templin Bradley Co. 90
Three Springs Fisheries 90
Tricker, Wm., Inc. 89
Vaughan's Seed Store 90
Vick, James 89, 90
Wayside Gardens 92
Wilmore, W. W. 90

HOTELS
Colton Manor Hotel 93
Lexington Hotel 93

MISCELLANEOUS
Artistic Medal Co. 93
Cargille, R. P. 96
Comfitape Laboratory 93
Glanz, A. 92
Hodgson Camp Houses 94
Lyons, Edw. C. 90
Metal Arts Co. 93
N. E. Sportsmen's & Motor Boat Show . . 94
Tax Sales Service 96
Wurster, C. Wm. 96

PETS & THEIR CARE
Chappel Brothers 96

PHOTOGRAPHIC
Leica Camera 49
Mevi 51
Palko, Inc. 49
National Exchange 51
Universal Photographers 96

SPORTING GOODS
Northland Ski Co. 93

TRAVEL
Union Pacific R. R. 49

TREES

as

Good Citizens

By
CHARLES
LATHROP
PACK

PRICE
$4.00

Unfolds the splendid story of the shade trees in simple words and clearest pictures, telling how to identify all varieties, how to select trees for various locations and help them grow luxuriantly, free from disease and injurious insects.

Cloth bound, 268 pages, 16 full color plates; 125 other illustrations.

A book for every one —home owners, teachers, students, engineers, public officials, librarians, and lovers of trees.

Order Now

AMERICAN NATURE ASSOCIATION
1214 16th St., N. W., Washington, D. C.

10-YEAR INDEX TO NATURE MAGAZINE

•

NOW AVAILABLE

•

In response to a very definite demand from our readers and recognizing that Nature Magazine is preserved by many individuals as well as libraries, we have gone forward with the task of compiling an index to the first twenty volumes of Nature Magazine.

This Index is in size the same as the page size of Nature Magazine, and may be bound in with Volume Twenty. It is so complete that it is also about the same thickness as one issue of the magazine.

The Index is complete to the last degree, including references to book reviews, brief notes and all illustrations as well as to the main articles.

The cost of compiling and producing this Index is considerable, but to anyone wishing to refer to back issues it is invaluable.

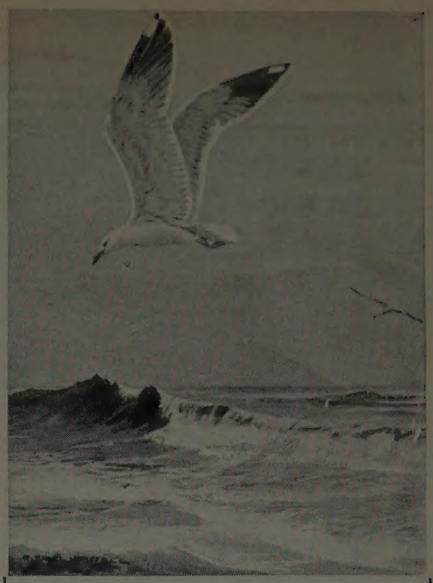
•

ORDER YOUR COPY OF THE TEN-YEAR INDEX NOW

•

Send One Dollar to

EDITOR, NATURE MAGAZINE
1214 16th St., Washington, D. C.



Wonderful Nature Paintings

By R. BRUCE HORSFALL

50 cents for Set of 12

FULL COLOR REPRODUCTIONS

Each size 9 x 12

Mailed flat. Printed on Heavy Paper

Special discounts for quantity orders from schools, colleges, libraries, etc.

The subjects are:

The Humming-Bird	The Elk
The Jaguar	The Gull
Great Blue Heron	The Blue Bird
Brown Bear	The Surf Scoter
Canada Geese	The Beaver
The Moose	The Junco

Note.—This remarkable set of reproductions of Mr. Horsfall's famous nature paintings is in great demand. We have had 10,000 sets prepared. They will be distributed as rapidly as orders are received.

Send your order at once to

AMERICAN NATURE ASSOCIATION
1214 Sixteenth Street
WASHINGTON, D. C.

CANADA GEESE

© NATURE MAGAZINE, WASHINGTO